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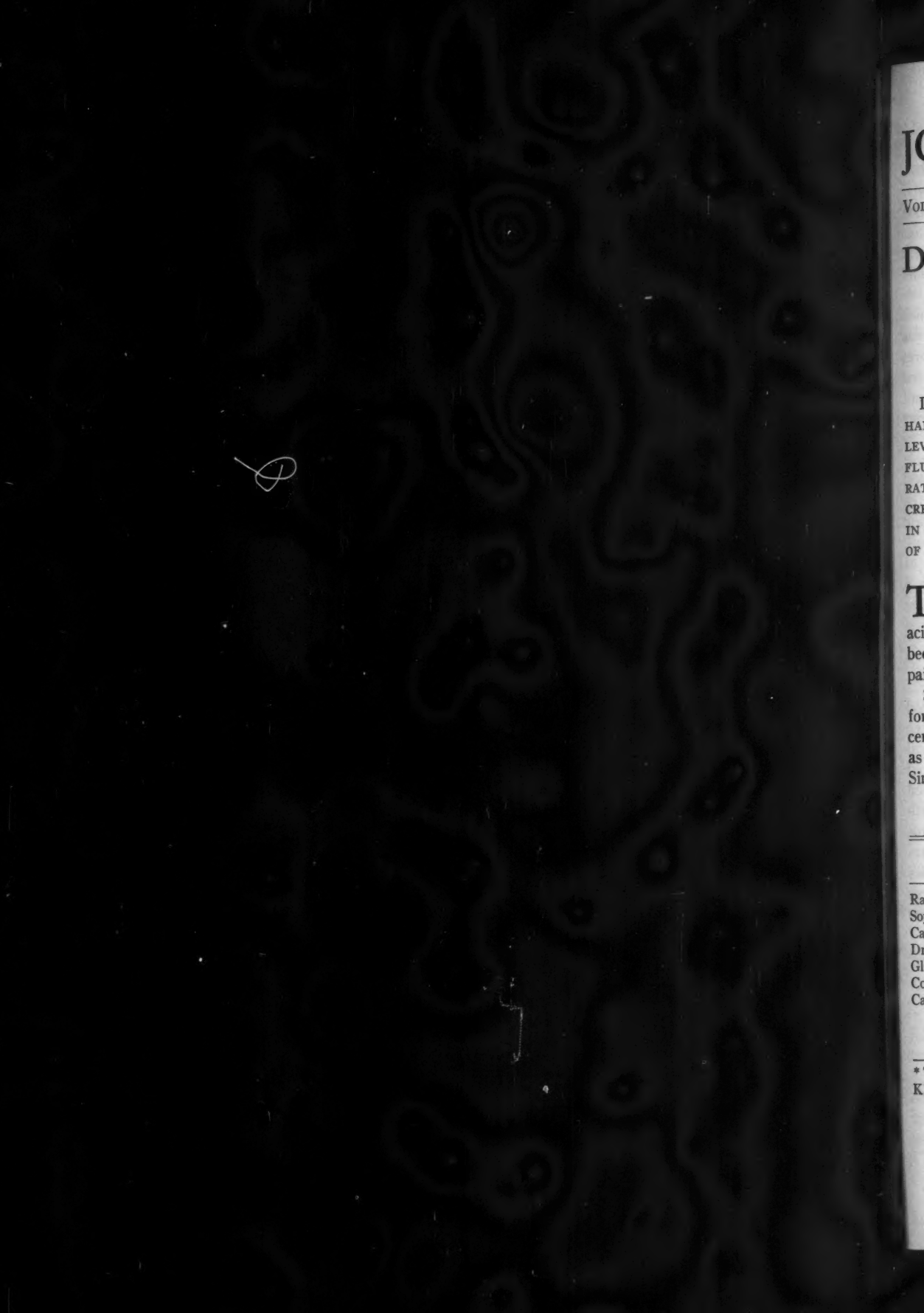

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Dietary Fat and Calcium Wastage in Old Age

G. G. KANE, FLOYD E. LOVELACE, AND C. M. McCAY

IN A SERIES OF 9 STUDIES ON RATS AND HAMSTERS IT WAS DETERMINED THAT THE LEVEL OF FAT IN THE DIET DID NOT INFLUENCE THE CALCIUM BALANCE FOR YOUNG RATS AND HAMSTERS BUT THAT WITH INCREASING AGE THE HIGHER THE FAT LEVEL IN THE DIET THE GREATER THE EXCRETION OF CALCIUM IN THE FECES.

THE formation of soaps in the feces and the wastage of both calcium and fatty acids in certain diseases of infants has long been studied, but little attention has been paid to similar problems during old age.

Some older people seem to have a hunger for fats and consume a relatively high percentage of their calories in this form whereas others appear to consume too little fat. Since assimilating sufficient calcium to maintain the skeleton during the latter third of life seems very difficult, any factors that tend to waste dietary calcium may be important. This problem was discussed in an earlier report (2).

Our attention was first directed to possible interrelationships between levels of dietary fat and calcium wastage by observations made in the course of a study to determine the comparative utilization of various calcium salts by old rats.

In these exploratory studies 12 rats that were 2 years of age were each found to be losing 8 to 14 mg. of calcium during a ten day period in which each rat was fed 180 mg. of calcium. The diet employed contained 19 per cent fat and had unsatisfactory physical properties. Therefore, the fat level was lowered to 9 per cent and the experiment

TABLE 1. DIETS USED FOR STUDIES ON RATS AND HAMSTERS

	No. 1	No. 2	No. 3	No. 4
Raw Corn Starch	30	30	30	30
Soya Flour (Non-fat)	20	20	20	20
Casein (Common)	10	10	10	10
Dried Brewers' Yeast	8	8	8	8
Glucose	30	20	10	0
Corn Oil	0	10	20	30
Calcium-free Salt Mixture*	2	2	2	2
Total (Grams)	100	100	100	100

* The salt mixture consisted on KCl, 41.56; NaCl, 34.93; $MgSO_4.7H_2O$, 19.34; $FeSO_4.5H_2O$, 4.00; NaF, 0.12; KI, 0.01; K Alum, 0.02; $MnSO_4$, 0.04; and $CuSO_4.5H_2O$, 0.08.

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Dr. Floyd Lovelace received his A.B. degree in 1928 and his Ph.D. Degree in 1935 from Cornell University. He did experimental research at the Agricultural Experiment Station at Geneva, New York, and became a research associate at Cornell University in 1947.

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with 4 different calcium salts repeated, keeping the daily ingestion of calcium the same. All 12 rats came into calcium equilibrium without regard to the salt providing the calcium.

Fat Level in the Diet and Calcium Wastage

Diets were then designed to provide four levels of fat ranging from 1 to 31 per cent (table 1). Each gram of these diets was further fortified with fat soluble vitamins to provide 40 I. Units of vitamin A, 4 I. Units of vitamin D, and 0.3 mg. of mixed tocopherol.

The methods used for the determination of calcium during the first section of this study (through table 7) were those of Corley and Denis (1) for feed and feces and Shohl and Pedley (4) for urine.

The method for calcium analysis which provided the data starting with table 8 was a micro modification of standard procedures for blood. A slurry of feces was prepared in a Waring Blendor so that a 10 ml. aliquot contained 2 to 5 mg. of calcium. The dry matter in the aliquot was determined by drying in tared porcelain dishes. The sample was then ignited in the muffle oven at 400 C. The ash was dissolved by heating on the steam bath with 10 ml. of dilute hydrochloric acid (1:10). After filtering into a 25 ml. flask the filter was washed until free of chlorides. After making up to volume, a 5 ml. sample was placed in a 15 ml. centrifuge tube. The remainder of the method was the same as that for blood serum.

Lipid Excretion in the Feces

The lipids were determined by the method of Saxon, which is a modification of the Roese-Gottlieb procedure. From the fecal slurry two 10 ml. aliquots were transferred to Rohrig tubes. One sample was acidified with concentrated hydrochloric acid. Both were then extracted with a mixture of petroleum and ethyl ethers in the usual manner. After evaporation of the ethers the samples were taken up in petroleum ether and dried. The difference between the weights of the

Table 2. Retention of Calcium by Old Rats (2 Years Old) at Different Dietary Fat Levels

Percentage Fat in Diet	Calcium in Feed Mg. per Day	Calcium in Urine Mg. per Day	Calcium in Feces Mg. per Day	Total Calcium Excreted Mg. per Day	Calcium Balance Mg. per Day
1	8	1.3	7.5	8.8	−0.8
11	8	1.2	8.8	10.0	−2.0
21	8	1.3	9.7	11.0	−3.0
31	8	1.4	10.4	11.8	−3.8

samples represented fats combined as soaps. The fatty acids in the original sample, not treated with hydrochloric acid before extraction, were determined by dissolving the sample in equal parts of chloroform and neutralized alcohol followed by titration with 0.05 N sodium hydroxide.

Twelve 2 year old female rats weighing 230 to 250 gm. were divided into 4 groups of 3 each. These were placed in individual metabolism cages. After a four day preliminary period, balance studies of ten days were run. Each rat was allowed 8 gm. of feed per day and this provided each with 8 mg. of calcium.

The summary of results from this study (table 2) indicates that the loss of calcium was related directly to the level of fat in the diet. The daily loss of calcium was more than four times as much for the high fat diet as for the lowest level.

Age, Fat Level, and Calcium Wastage

A new experiment was designed to determine the age at which old rats tended to lose calcium as a result of high levels of lipids in the diet. Diets 1 and 3 were the ones chosen for comparison, since they provided 1 and 21 per cent of fat. Individual balance studies were run upon 2 groups of 6 rats fed each level of fat. Twelve rats of the following ages were used: 6, 24, 48, 72, and 96 weeks. These were all females since no males of the oldest group were available. Each rat was allowed 8 mg. of calcium daily. This amounted to 0.1 per cent of the diet and is equivalent to a human diet providing a half gram of calcium daily.

The results of this study (table 3) indicate that the year old rat is already having difficulty in maintaining its calcium balance if the diet contains 0.1 per cent of calcium. Whereas at 6 months of age the rat can still store calcium from the diet. The level of fat in the diet has no effect upon calcium storage up to the age of 6 months. Furthermore, the amount of lipids excreted in the feces seems independent of the lipid level until the rat has attained the age of 24 weeks.

The group of rats that were 48 weeks of age seems to have reached a turning point. The calcium balance was slightly negative, indicating that 8 mg. per day were inadequate. Furthermore, the lipid excretion on the 21 per cent fat level was slightly higher. These changes are still more marked in the rats that had attained ages of 72 and 96 weeks. In these rats the losses of both calcium and lipids were much more marked for

Table 3. Interrelationship of Age, Dietary Fat Level, and Excretion of Calcium and Fat Among Rats*

Age Weeks	Fat Intake % of Diet	Calcium Excreted Mg. per Day	Total Lipid Excreted Mg. per Day	Calcium Balance Mg. per Day
6	1	2.3	40	+5.7
6	21	2.3	40	+5.7
24	1	7.2	50	+0.8
24	21	7.2	50	+0.8
48	1	8.2	55	−0.2
48	21	8.3	63	−0.3
72	1	9.0	71	−1.0
72	21	9.4	118	−1.4
96	1	9.1	80	−1.1
96	21	11.1	249	−3.0

* Six white rats on each diet.

the rats upon the higher lipid diet.

The calcium losses were due to increases in fecal calcium since the urinary calcium for all individual rats beyond the 6 weeks group was very constant. The urinary calcium varied from 1.1 to 1.5 mg. daily for individuals from all groups.

Studies with Hamsters

In order to have a species other than the rat for studying the interrelationship between age, fat level, and calcium storage, the Syrian hamster was used. Twelve hamsters that were 6 weeks old were compared with 12 that were 60 weeks of age. This allowed groups of 6 for each fat level. The young hamsters were restricted to 5 gm. of feed and the older ones to 6 gm. per day. This allowed an intake of 5 mg. of calcium per day for the young hamsters and 6 mg. for the old ones. Female hamsters were used and the diets were No. 1 and 3 (table 1) that had been used for the rats.

The results of this study (table 4) were similar to those with rats. The level of fat in the diet did not influence the calcium balance for young hamsters, nor did this fat level modify the lipid excreted in the feces of the young animals. In contrast, the old hamsters lost more lipids and calcium in the feces when the diet was high in fat. These old hamsters were in negative calcium balance, indicating that 6 mg. daily was not enough to hold them in equilibrium.

Since the hamster has the same span of life as the white rat, it can be estimated that 10 days in the life of this species equals a year in the life of man. Therefore, the groups compared are equivalent to man, age 4 and 42 years.

Paths of Excretion of Calcium by the Hamster

Many factors are known to influence the relative amounts of calcium excreted through the feces and urine of any species. In the present case we have data illustrating the difference between the albino rat and the hamster. For some time it has been known in our laboratory that the hamster excretes a higher percentage of the calcium in its urine than the rat does. In these experiments the diets, age, and sex of the two species were similar.

Under these conditions the young hamsters excreted equal amounts of calcium in the urine and feces (table 5). The old hamsters doubled this amount in the urine but increased that in the feces by ten times. Old hamsters excreted more calcium through the urine and about the same amount through the feces as old rats, even though the daily ingestion was lower for the hamster and the rats were 12 weeks older. This may indicate that the hamster starts earlier to have difficulties in the maintenance of calcium balance. The hamster may prove more useful than the rat for the study of calcification in the kidneys.

Table 4. Interrelationship of Age, Dietary Fat Level, and Excretion of Calcium and Fat Among Hamsters*

Age Weeks	Fat Intake % of Diet	Caclium Excreted Mg. per Day	Total Lipid Excreted Mg. per Day	Calcium Balance Mg. per Day
6	1	1.6	40	+3.4
6	21	1.6	41	+3.4
60	1	9.1	58	−3.1
60	21	10.8	149	−4.8

* Six hamsters on each diet.

TABLE 5. RELATIVE AMOUNTS OF CALCIUM EXCRETED IN THE URINE AND FECES OF RATS AND HAMSTERS FED SIMILAR DIETS (ALL VALUES IN MG. PER DAY PER ANIMAL)

Species	Age Weeks	Diet No.	Calcium Intake	Fecal Calcium (Range)	Urine Calcium (Range)
Hamster	6	1	5	0.8–0.9	0.7–0.8
Rat	6	1	8	1.4–1.6	0.6–0.9
Hamster	6	3	5	0.7–0.9	0.7–0.8
Rat	6	3	8	1.4–1.7	0.6–0.9
Hamster	60	1	6	7.2–7.5	1.7–1.9
Rat	72	1	8	7.5–7.8	1.2–1.3
Hamster	60	3	6	8.8–9.3	1.7–1.9
Rat	72	3	8	8.3–8.6	1.3–1.4

HARDNESS OF FOOD FAT AND CALCIUM WASTAGE IN OLD RATS

Young adult rats utilize hard and soft fats almost equally well. In earlier studies (4) it was found that rats utilized about 97 per cent of cottonseed oil and 96 per cent of the hydrogenated oil. The differences were not considered significant.

TABLE 6. HARDNESS OF FAT AND CALCIUM WASTAGE AMONG OLD RATS AT 21 PER CENT FAT LEVEL

Kind of Fat	Calcium in Feed Mg. per Day	Calcium in Feces Mg. per Day	Calcium in Urine Mg. per Day	Total Calcium Excreted Mg. per Day	Calcium Balance Mg. per Day
Corn Oil	8	9.8	1.4	11.2	−3.2
Range		9.7–9.9	1.2–1.5	11.0–11.2	
Butter Oil	8	10.0	1.3	11.3	−3.3
Range		9.8–10.1	1.2–1.4	11.1–11.4	
Mutton Tallow	8	10.9	1.3	12.2	−4.2
Range		10.8–11.1	1.2–1.4	12.0–12.5	

To determine if the melting point of fats influenced the calcium balance, a study was made using 3 groups of 96 week old female rats, each group containing 6 animals.

Diet No. 3 containing 21 per cent fat was used except that three different fats were employed, namely, corn oil, butter oil, and mutton tallow. The calcium intake was held constant at 8 mg. per day for all 18 rats.

The results (table 6) indicate that wastage of calcium was about one-fourth greater as a result of feeding mutton tallow in contrast to corn and butter oils.

THE EFFECT OF HIGHER LEVEL OF VITAMIN D INTAKE

In order to determine if a higher level of vitamin D intake might affect calcium storage, balance studies were run with a group of 6 female rats ranging in age from 104 to 110 weeks. These same rats were used for 10 day balance studies with 4 day periods intervening to allow adjustment to the new diets. The diet was similar to No. 3, except that corn starch replaced the glucose.

Two levels of calcium intake constituting 0.3 and 0.5 per cent of the diet were studied. The calcium was supplied in the form of calcium carbonate. Vitamin D was incorporated at 4 and 40 I.U. per gram of feed in order to compare these two levels with the two of calcium. Using rats of this age it is barely possible to hold them in calcium balance with 0.3 per cent of calcium in the diet.

TABLE 7. LEVEL OF VITAMIN D AND CALCIUM BALANCE IN RATS

Percentage Calcium in Diet	Vitamin D Level I.U. per Gram	Fecal Calcium Mg. per Day	Urine Calcium Mg. per Day	Food Calcium Mg. per Day	Calcium Balance Mg. per Day
0.3	4	17.5	1.4	18	+0.3
0.5	4	28.4	1.4	30	+0.2
0.3	40	17.6	1.3	18	−0.9
0.5	40	28.6	1.4	30	0.0
0.3	4	17.5	1.4	18	−0.9

The results of this study (table 7) afford no evidence that the higher level of vitamin D had any favorable effect upon calcium storage by these old rats.

FAT LEVEL AND VARYING INTAKE OF CALCIUM

In all previous studies the calcium ingestion was kept constant by restricting the intake of feed to that eaten daily by the animal with the poorest appetite in the group. Since animals govern their food ingestion largely on the basis of energy needs, the weight of feed eaten varies with the level of fat in the diet.

An experiment with rats was designed in which the percentage of calcium in the diet was kept constant but different diets contained varying levels of fat. These diets were similar to those of table 1. The animals were allowed to consume as much feed as desired.

Two groups of old rats were used in this study. One group of 8 females ranged in age from 590 to 917 days of age at the start of the experiment. The other group of 8 females ranged in age at the beginning from 408 to 411 days at the start.

The rats were kept in individual metabolism cages. For the first 14 days all were fed the high fat diet (32.9 per cent), then the next level (21.4 per cent), then the next (11.8 per cent), and, finally, the lowest (2.4 per cent).

Since the outcome of these studies was the same with both groups of rats but since a number of the older group died before the conclusion of the study, data have been presented only for the younger group of rats (tables 8 and 9). In this study the rats went into negative calcium balance when fed the two diets providing higher fat levels and lower daily allowances of calcium.

FAT WASTAGE FROM HIGH FAT DIETS

As the level of fat in the diet was increased, the amount of total lipids, free

TABLE 8. EFFECT OF DIETARY FAT LEVEL UPON CALCIUM BALANCE WITH VARIABLE INTAKE OF CALCIUM IN RATS

Fat Level in Diet (% Dry Basis)	Dry Feed Ingested per Day per Rat (Grams)	Calcium Ingested per Day per Rat (Mg.)	Calcium Excreted per Day per Rat (Mg.)	Calcium Balance per Day per Rat (Mg.)	Calcium Combined as Soap per Day per Rat (Mg.)
2.4	10.3	12.3	10.7	+1.5	0.5
11.8	10.2	13.2	10.2	+3.0	0.4
21.4	7.7	9.2	10.9	−1.7	0.6
32.9	5.8	6.3	10.1	−4.2	0.7

fatty acids, and soaps increased in the feces. As the free fatty acids are increased the conditions for combining these acids with calcium are probably more favorable and hence more calcium tends to be lost through the feces.

Summary

The level of fat in the diet has a substantial effect upon the conservation of calcium in old rats and hamsters. In diets ranging in fat level from 1 to 33 per cent the excretion of calcium in the feces was proportional to the lipid content of the diet when the daily calcium ingestion was kept constant. This was true for old rats and hamsters but not for young or middle-aged ones.

The hardness of dietary fat also influenced calcium retention since the feeding of tallow to old rats produced a greater loss of calcium than the feeding of butter and corn oils.

High levels of vitamin D fed to old rats had no effect upon the calcium balance.

The fecal lipids of old rats, as well as the soaps and free fatty acids, increase in amounts as the lipid level of the diet increases.

When fed similar diets, hamsters excrete a higher percentage of the total calcium in the urine than do rats of similar age. This suggests the hamster may provide a unique experimental animal for the study of kidney calcification.

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Table 9. Effect of Dietary Fat Level upon Fecal Lipids in Old Rats

Level of Dietary Fat (% Dry Basis)	Weight (mg.) per Rat per Day								
	Neutral Fat			Soaps			Free Fatty Acids		
	Mean	Probable Error	Extremes	Mean	Probable Error	Extremes	Mean	Probable Error	Extremes
2.4	33	3.4	25–41	7	2.7	2–13	14	1.8	8–16
11.8	44	6.7	28–54	5	1.9	0–10	15	2.5	9–20
21.4	64	7.6	50–86	21	4.3	11–32	20	4.1	10–26
32.9	78	15.8	25–115	25	5.1	12–35	37	6.1	25–52
Level of Dietary Fat (% Dry Basis)	Percentage of Fat Ingested (10 Day Period)								
	Neutral Fat			Soaps			Free Fatty Acids		
	Mean	Probable Error	Extremes	Mean	Probable Error	Extremes	Mean	Probable Error	Extremes
2.4	13	1.6	10–18	4	1.8	1–8	5	1.0	3–8
11.8	4	0.4	3–4	0.4	0.2	0.0–0.8	1.2	0.1	1.0–1.6
21.4	4	0.4	3–5	1.3	0.2	0.7–1.6	1	0.4	1–2
32.9	4	1.6	1–10	2	0.7	1–4	2	1.0	1–6

References

1. Corley, R. C., and W. Denis: The Determination of Calcium in Tissues, Feces, and Milk. *J. Biol. Chem., 66:* 601–608, 1925.
2. Kane, G. G., and C. M. McCay: Calcium Requirements of Old and Young Hamsters and Rats. *J. Gerontol., 2:* 244–248, 1947.
3. McCay, C. M., and H. Paul: The Effect of Melting Point of Fat upon Its Utilization by Guinea Pigs. *J. Nutrition, 15:* 377–382, 1938.
4. Shohl, A. I., and F. G. Pedley: A Rapid and Accurate Method for Calcium in Urine. *J. Biol. Chem., 50:* 537–544, 1922.

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Changes in the Endocrine Glands of the Fowl with Age

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THIS PAPER WAS PRESENTED AT THE ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. ON INVITATION OF THE PROGRAM COMMITTEE AS A PART OF A SYMPOSIUM ON THE SCIENTIFIC APPROACHES TO THE PROBLEMS OF AGING. DR. PAYNE DEMONSTRATES THAT IN FOWLS THE PITUITARY UNDERGOES RETROGRESSIVE CHANGES WITH AGE. CORRELATED OR CAUSED BY THIS PROCESS ARE CHANGES IN THE THYROID, TESTES, OVARIES, AND ADRENALS.

C. O. WHITEMAN once said "theory without fact is fantasy; fact without theory is chaos." I am not sure whether fact or theory is ahead in the race toward a solution of the much involved problems of aging. There is, however, a scarcity of verifiable facts, basic facts on which to build sound logical theories; theories which; without prejudice, take into consideration facts from all sources and which recognize the wide ramifications of the problems.

From a biologic point of view aging is a part of the problem of growth which includes not only increase in size and differentiation from the simple to the complex, but may include dedifferentiation, even degeneration and loss, a change in size and form, a change of functional activity, and finally death itself. Where the problem ends is clear. Where it begins is not so clear, but this aspect of the subject will not be discussed. Perhaps heredity plays the major role in the aging of living organisms. But where heredity ends and when, where, and how other factors enter are questions not easily answered.

My studies have been largely factual and were planned about ten years ago with Breneman. We thought then there was need of a comprehensive, longtime study of the endocrine glands of the fowl. He was to undertake the physiologic studies, I the cytologic. The facts pertaining to aging are merely a segment of the overall study begun at that time.

This is neither the time nor the place to review the literature, either theoretic or factual. My remarks will be limited to the fowl; because of variability between species and even within species, I have no right to generalize. To date I have been concerned largely with the study of the changes which occur in the pituitary, gonads, thyroid, and adrenals. While we are interested in causes of aging changes, we need, first of all, to know more about the changes themselves. Some believe that these changes are now known, but knowledge to be gained from cytologic studies is far from complete and there is much divergence of opinion in the literature.

That a study of aging limited to the endocrine glands, either cytologic or physiologic, or both, will give answer to the causes of aging is very doubtful. We need, however, to learn as much as we can about these glands. That they play a part, either directly or indirectly, in aging seems logical even if the evidence is far from conclusive at present.

Dr. Payne received his A.B. degree in 1905 and his M.A. degree in 1906 from Indiana University; he received his Ph.D. in 1909 from Columbia and his Sc.D. in 1935 from Franklin College. Dr. Payne served as assistant in zoology at Indiana University from 1905 to 1907, as assistant professor 1909 to 1912, as associate professor 1912 to 1919, and as professor since 1919. He also served as chairman of the department of zoology, 1925 to 1948. He was assistant dean of the graduate school from 1925 to 1927 and dean from 1927 to 1947. Dr. Payne was vice-chairman of the division of biology and agriculture of the National Research Council 1931 to 1932 and chairman 1932 to 1933. He is a member of the Society of Naturalists, the Society of Zoologists (president 1931), and the Genetics Society. His chief interests are cytology, genetics, and embryology.

Before describing aging changes in the fowl pituitary, the pituitary in growth and development from hatching up to and including the period of sexual maturity will be discussed. Unless otherwise specified, statements refer to White Leghorns. The exact number of different kinds of cells in the pituitary has not been determined. All recognize, however, two secretory types, the basophiles (fig. 1) and acidophiles (fig. 2) and a third type, the chromophobes (fig. 3) from which the secretory types arise.

It is generally accepted that the basophiles secrete gonadotropic hormones. The functions of the acidophiles are not so well established. At hatching, and probably earlier, acidophiles can be distinguished. There can be no mistake as to their identity when secretory granules are present. The transition from chromophobe to basophile is a gradual one with no marked differences in staining reaction. Hence it is not possible to state definitely when a cell ceases to be a chromophobe and becomes a basophile. A landmark, a large, usually spherical nucleolus, however, sooner or later appears which distinguishes a basophile from all other cells. Eventually, as growth continues, basophiles become much larger than chromophobes and the cytoplasm becomes denser and stains darker with methyl-green.

Large, easily distinguishable basophiles are present at 3 days of age or earlier in the male and at 10 days or earlier in female chicks. Whether gonadotropic hormones are secreted previous to these ages I do not know, but from Breneman's (1) observation on gonad and comb growth the pituitary influence on the gonads begins about these ages. The pituitary grows by the multiplication of chromophobes which differentiate into acidophiles and basophiles, and to some extent by the division of secretory cells. While the acidophiles increase in number and size, the most conspicuous change in the growth of the pituitary from hatching to sexual maturity is the increase in size and number of the basophiles.

The growth curve of the basophiles for the most part, is a straight line. There are plateaus, according to Breneman (1), but for the moment they can be ignored. The acidophiles also gradually increase in number. There is much individual variation but generally speaking the basophiles reach a high degree of development at 100 to 110 days of age in the male and at 120 to 125 days of age in the female. In some individuals there may be a further increase in the size of the pituitary with advancing age, but relatively speaking the number of basophiles probably does not increase. These statements apply to fowls reared under the best environmental conditions and fed the best rations, but even at best there are variations in the pituitary picture. Adverse conditions hinder basophilic development and encourage acidophilic development.

Even before the high degree of basophilic development reached in the male at about 100 to 110 days, certain changes in the mitochondria of the basophiles have already made their appearance (fig. 4). These changes may be present as early as 65 days. Usually, however, they appear later. A bird of 179 days may show no more modifications

than one of 65 days. At first only a few cells are involved, but the number increases gradually through the years.

In active functional basophiles mitochondria are present in the form of relatively large granules. At 65 days of age or later some of the mitochondria in some cells become vesicular with a periphery which stains red with acid fuchsin and a central region which has a tinge of yellow or lemon due to picric acid treatment in the staining process. In material which has been osmicated but not stained, the periphery is blackened by the osmic acid while the central region appears as light ivory colored, opaque material. The vesicles eventually fuse to form larger vesicles (fig. 5). They have the property of independent growth as well as fusion and may become so large that the cell is filled with them or with a single vesicle if fusion is complete. The nucleus becomes pushed aside and compressed (fig. 6). Eventually nuclei and cells are destroyed leaving the vesicles lying in intercellular spaces. There is much variation among cocks as to the number of basophiles so modified. In cocks 3 and 4 years old as many cells may be affected as in cocks 6 and 9 years, but the degree of change in younger cocks is not so marked (fig. 7).

The mitochondrial changes just described are not found in hens up to and including 9 years of age, but they are present at 13 years. Unfortunately there is no material between these ages. The fact is well established, however, that mitochondrial behavior in the basophiles of the two sexes is very different.

Following castration in fowls, the basophiles increase in number and size while the acidophiles regress. In the basophiles of operated cocks and hens mitochondrial changes occur as in control males with the difference that changes are more rapid and more cells are affected. A castrate Brown Leghorn of 6 years is much more highly modified than a Rhode Island Red cock of 9 years or a White Leghorn hen of 13 years. From these facts we may infer that the absence of the gonads and hence the absence of their secretions accelerates pituitary degeneration.

While in some old cocks 50 per cent or more of the basophiles may undergo mitochondrial changes, other basophiles show no such changes. Instead they gradually shrink in size, the cytoplasm becomes darker, and the nuclei grow smaller and pycnotic. Such cells cannot be active. Similar changes occur in female pituitaries. As a result of these two kinds of retrogressive changes in the basophiles of old cocks and hens, gonadotropic hormone production certainly is at a low ebb. It cannot be said, however, that it ceases entirely, and perhaps, as Carlson (2) has pointed out, a small amount may be sufficient.

The fact remains, however, that sperm formation and egg production in the fowl decline with advancing years. In a 9 year old Rhode Island Red cock there was no sperm formation and the walls of the sex cords had disappeared. According to the reports of Turner (6) and others, egg production is reduced by 12 to 20 per cent each year after the first laying season. Of course, pituitary and gonad changes could be nothing more than parallel developments, but it is known that gonad growth in the young chick is dependent in part, at least, on one or more hormones of pituitary origin. It is also known that young cocks after reaching sexual maturity and young hens during laying periods have a pituitary in which the basophiles are large and numerous. In other words there is a correlation between sexual activity and basophilic development. If the gonads are active because of pituitary hormones, it would seem logical to assume that as gonadotropic hormone production recedes, the gonads would wane.

In further support of this point of view, following hypophysectomy all gonad activity ceases. Turner's recent experiments (6) with feeding thyroprotein to laying hens demonstrate clearly that there is not always

present a sufficient quantity of thyroxine for maximum egg production. By feeding thyroprotein containing 2.7 per cent thyroxine, 10 gms. per 100 pounds of food, to hens during the third, fourth, fifth, and sixth laying years, he obtains in his experimental birds a higher yearly average egg production than in controls. In fact the results are such as to cause one to wish that the experiment might be repeated.

In the third year the average egg production in the controls was 141.9 as contrasted with 128.5 in the experimental birds. During the next three years, however, egg production decreased in the controls to 82.5, 57.5, and 35.1 for the fourth, fifth, and sixth years respectively. In the experimental birds, on the other hand, the averages were 105.0, 93.4, and 118.5—a marked increase over the controls. Turner (6) interprets these results to mean that in aging birds thyroid activity declines below the level necessary for high egg production by failing to activate the pituitary to produce the necessary gonadotropic hormones. Whether his explanation is correct will not be discussed here, but it does seem conclusive that thyroprotein feeding to aging hens increases egg production above that of controls.

Turner's results (6) are in conformity with the earlier but more limited observations of Crew (3).

It is common knowledge that egg production in the fowl can be increased by lengthening the daily light period. The presumption is that light acting upon the pituitary causes an increase in gonadotropic hormone production. This observation, as well as the experiment of Turner (6), is cited to show that hormone productivity in the fowl, either by the thyroid or the pituitary, may fall below the level for maximum efficiency in egg production. Such observations, as well as my own on retrogressive and even degenerative changes within the secretory cells, lead me to question, insofar as the fowl is concerned, the oft repeated statement that a greatly reduced output on the part of an endocrine gland may still suffice. Sufficient for life on a low declining level is one thing. Sufficient for maximum efficiency as in young, actively reproducing animals is another.

Various functions have been assigned to the acidophiles such as the secretion of the growth, adrenotropic, and thyrotropic hormones, and prolactin. Evidence for these or other functions, however, is somewhat meagre. These cells are present before hatching and remain throughout the life of the fowl in greater or lesser numbers. They are conspicuous in young chicks before the basophiles start their rapid development. They are numerous in chicks fed on a limited diet, in dwarfs, and in chicks injected with stilbestrol. They are reduced in number following castration. Speaking generally, they are more numerous in females than in males.

In these acidophiles certain definite changes appear in fowls 6 or more years old and become more pronounced with age. Eventually only a few cells in the posterior region of the pituitary retain their secretory granules. Even these cells are smaller than the active acidophiles of young birds. In each is a body of unknown origin, which may be as large as the nucleus (fig. 8). With the stains used it is uniform throughout, and in appearance it is similar to the central region of the modified mitochondria of basophiles.

Other acidophiles of the mid and anterior regions contain numerous pigment granules, and the evidence to date indicates that these granules are modified mitochondria. Thus the acidophiles as well as basophiles regress and become inactive in old fowls.

The pituitary of young chicks is a solid mass of cells divided into irregular cords by thin layers of connective tissue. These cords correspond, in part at least, to folds in the oral epithelium from which the pituitary arose. There are no cavities and no ducts. At 2 years of age or later, however, small cavities or acini appear in the posterior end

of the gland. They increase in number until in fowls 8 and 9 years old they are distributed throughout the entire pituitary. While the cavities contain colloidal material, the cells around them do not have the appearance of secretory cells.

My studies of the thyroid and adrenal glands are still in the preliminary stages. They have progressed far enough, however, to state that in hens 6 to 9 years old, the thyroid and adrenals are much reduced in size and in the number of secretory cells. In the thyroid there is not only a reduction in follicle size with an accompanying reduction in colloid, but also a reduction in follicle number. Some of the secretory cells, however, are still active but the activity of the gland as a whole is certainly reduced much below that of a young bird.

In the adrenals the cortical and medullary cells probably act separately and independently of each other, but both show aging changes. The medullary cells seem least modified. There is some shrinkage in size but the most conspicuous change is the appearance of a body somewhat similar to that described for the acidophiles of the pituitary. Its origin and significance I do not know.

In the cortical cells the most obvious changes are the accumulation of pigment and to some extent the degeneration of the cells themselves. The probability is that these pigment granules, as in the acidophiles of the pituitary, arise from mitochondria.

In order to throw further light on pituitary function, more particularly on hormone interrelationships, a few additional observations in the fowl will be described.

Following thyroidectomy in mammals various authors (4, 5, 7) have described a type of cell which seems to appear only at such times (fig. 9). There have been some differences of opinion concerning these thyroidectomy cells or T-cells as they are called. What are they? What is their origin? Are they different? The fowl gives us a more definite answer to some of these questions than does the mammal, for here there can be no mistake about their presence. Most of them, if not all, arise directly from chromophobes. They appear in the anterior end of the pituitary, and near the periphery, where in young chicks only chromophobes are found. They become as large as large basophiles but can be distinguished from them by their location and nuclear appearance even though they stain with methyl-green as do the basophiles. The function of these cells is unknown but their behavior following thyroidectomy parallels the behavior of basophiles following castration. Since the basophiles secrete the gonadotropic hormone, the possibility that the thyroidectomy cells may secrete the thyrotropic hormone is suggested.

A remarkable transformation of the pituitary occurs in broody hens. At the peak of these changes two-thirds or more of the entire gland may be involved. All cells, directly or indirectly, transform into small cells with large clear nuclei (fig. 10). The cytoplasm contains numerous small acidophilic granules. Such cells, however, are far different from the typical acidophiles. They disappear at the end of the broody period or at the end of the period of care of the young. Their function is still an open question but the most logical suggestion is that they may produce a hormone which is concerned somehow with broody behavior.

Summary

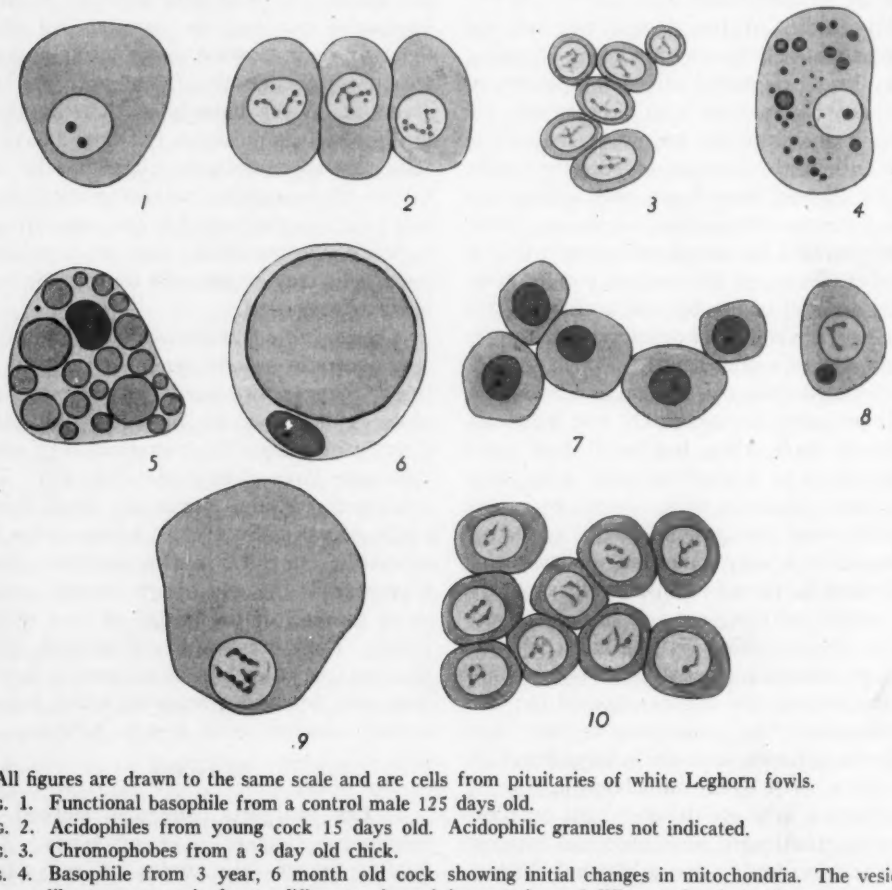
1. The pituitary undergoes marked retrogressive changes in aging fowls. This applies to all three types of cells—basophiles, acidophiles, chromophobes.

2. Fifty to 75 per cent of the basophiles of old cocks may exhibit mitochondrial changes which result either in reduced secretory activity or the death of the cells.

3. In addition to these mitochondrial changes other basophiles not so affected become smaller with dark cytoplasm and small pycnotic nuclei. Their secretory activity certainly ceases. Only a few cells can possibly be functional.

4. In the basophiles of hens mitochondrial changes are delayed beyond 9 years, but shrinkage of cell and nuclear size proceeds as in the male, resulting in a pituitary much reduced in secretory activity.

5. In old fowls, acidophiles with secretory granules are reduced in number, but a few small cells are always present. In each of these cells is a single body, reaching sometimes the size of the nucleus. There is no



All figures are drawn to the same scale and are cells from pituitaries of white Leghorn fowls.

FIG. 1. Functional basophile from a control male 125 days old.

FIG. 2. Acidophiles from young cock 15 days old. Acidophilic granules not indicated.

FIG. 3. Chromophobes from a 3 day old chick.

FIG. 4. Basophile from 3 year, 6 month old cock showing initial changes in mitochondria. The vesicle-like appearance is due to differences in staining reactions of different chemical substances.

FIG. 5. With growth in size and with fusion of the modified mitochondria, cells like fig. 5. are obtained. The nucleus has become pycnotic and is under pressure.

FIG. 6. Fusion is complete in this figure, and the nucleus is pushed to the periphery. Soon the cell wall will disintegrate.

FIG. 7. Basophiles from a 5 year old cock which have not undergone changes like those in figs. 4, 5, and 6 but which have regressed in size and in which both cytoplasm and nuclei have beome pycnotic. Such cells are not functional.

FIG. 8. An acidophile from a 6 year old cock showing body of unknown origin and significance lying in the cytoplasm. Such bodies are not found in young birds.

FIG. 9. Large thyroidectomy cell. These cells appear in chicks from 30 to 40 days old when the thyroid is removed at 5 days.

FIG. 10. Broody cells. These cells appear only in hens during the broody period.

differentiation within the body as with the mitochondrial vesicles, the whole having the appearance of the central region of the mitochondrial vesicle.

6. Castration causes an increase in number and size of the basophiles and a regression of acidophiles.

7. Pituitary changes in ovariectomized hens are similar to those in capons.

8. Aging changes in the pituitary of castrates are more rapid and more pronounced than in control cocks.

9. Whether the reduced activity in the pituitary of old birds is sufficient to meet maximum or even the minimum needs is still an open question, but the evidence from cytologic studies indicates an insufficiency.

10. Correlated with aging pituitary changes, if not caused by them, are changes within the thyroid, testes, ovaries, and adrenals. Sperm formation was much reduced in an 8 year old White Leghorn cock and absent in a 9 year old Rhode Island Red cock. It is common knowledge that hens lay the largest number of eggs the first year and that the number is reduced by 12 to 20 per cent each succeeding year.

11. Turner's results (6) demonstrate that egg production can be increased in hens 7 years old by thyroprotein feeding.

12. Pigment granules, probably of mitochondrial origin, are present in acidophiles and in cortical cells of the adrenals.

13. At 2 or 3 years of age cavities or acini appear in the posterior end of the pituitary. With advancing age they increase in number and are present in all regions.

14. Thyroidectomy causes the enlargement of certain cells in the pituitary which have been called T-cells. They are neither basophiles nor acidophiles.

15. In broody hens there is a complete transformation of a large part of the pituitary, as much as two-thirds in some instances, into broody cells.

16. The thyroid and adrenals are much reduced in size in hens from 5 to 8 years old. While secretory activity was certainly much reduced, some activity continued.

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References

1. Breneman, W. R.: Male Hormone and the Testis-Comb Relationship in the Chick. *Endocrinology, 21:* 503–510, 1937.
2. Carlson, A. J.: The Thyroid, Pancreatic Islets Parathyroids, Adrenals, Thymus and Pituitary. *Problems of Aging,* edited by E. V. Cowdry, Chap. 13. Williams and Wilkins, Baltimore, 1939.
3. Crew, F. A. E.: Rejuvenation of the Aged Fowl Through Thyroid Medication. *Proc. Roy. Soc. Edinburgh, 45:* 252–260, 1925.
4. Guyer, M. F.: Vacuolation of the Anterior Pituitary Gland Following Castration, Implantation of Cancer Tissue and Thyroidectomy. *Anat. Rec. 67:* 145–155, 1937.
5. Severinghaus, A. E., Smelser, G. K., and Clark, H. M.: Anterior Pituitary Changes in the Adult Male Rat Following Thyroidectomy. *Proc. Soc. Exper. Biol. & Med., 31:* 1127–1129, 1934.
6. Turner, C. W., and Kempster, H. L: Mild Hyperthyroidism Maintains Egg Production with Advancing Age. *Poultry Science, 27:* 453–458, 1948.
7. Zeckwer, I. T.: The Adrenals and Gonads of Rats Following Thyroidectomy Considered in Relation to Pituitary Histology. *Am. J. Physiol., 121:* 224–230, 1938.

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Effect of Testosterone Administration on the Beard Growth of Elderly Males

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FROM HER STUDY OF 11 NORMAL ELDERLY MEN DR. CHIEFFI OBSERVED THAT THE ADMINISTRATION OF TESTOSTERONE PRODUCED A MARKED STIMULUS TO BEARD GROWTH. SHE DISCUSSES THE LITERATURE ON FACIAL HYPERTRICHOSIS IN NORMAL WOMEN UNDERGOING HORMONAL TREATMENT AND THOSE WITH PATHOLOGIC GLANDULAR CONDITIONS AS WELL AS THE RESULTS OF ANDROGEN ADMINISTRATION TO HYPOGONADAL MALES.

THE present study was undertaken with a view of investigating the effect of testosterone administration on the beard growth of normal elderly males. The beard is a secondary sex trait of the male which is normally absent in the female and lacking in males who have been hypogonadic from an early age. In spite of the marked association of androgenic activity with the onset of beard production, Danforth (2) is of the opinion that its growth is not directly conditioned by the testicular secretion. He considers that the constitution of the hairs is the more important factor and is responsible for determining whether or not a given hair follicle will respond to humoral stimulation by developing hair of the secondary sex type.

With regard to the role of androgens in stimulating beard growth, the literature contains very little data obtained from a study of normal males but much indirect evidence has been derived from an investigation of certain clinical states associated with abnormal androgen production and also from the therapeutic use of androgenic substances.

The most outstanding examples of the association of beard growth stimulation and excessive androgen production are found in females presenting pathologic states in which there is hyperplasia of the adrenal cortex. Flynn (6) reports 7 cases of hypertrichosis of the face in females in whom the 17-ketosteroid excretion was greatly elevated. Further study showed one of the patients to be suffering from a malignant tumor of the adrenal gland, 2 from adenomata of the cortex, and the remaining 4 from cortical hyperplasia. In all cases, removal of the hyperplastic tissue was followed by a fall in the androgen excretion and by a regression of the heterosexual hair. Ducuing and Benaygues (3) describe a case of primary cancer of the adrenal cortex with elevated 17-ketosteroid excretion in which they refer to the beard growth as being luxuriant.

Pedersen (13) studied a number of women with facial hypertrichosis and in all cases found some increase in the excretion of the 17-ketosteroids. He did not find, however, that all women showing elevation of the urinary excretion of androgens developed heterosexual hair. This he attributed to a higher estrogen production on the part of these women, thus postulating an antagonistic action between androgenic and estrogenic substances at least with regard to the production of sexual hair. The findings of Bissel and Williams (1) are not in complete

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agreement with those of Pedersen. These authors studied 26 cases of hypertrichosis in women and found only occasionally an elevated 17-ketosteriod excretion. Stoddard (15) describes 2 cases of hirsutism associated with pregnancy. In both these women there was an increased androgen excretion. One patient was subjected to laparotomy but no pathologic change of the adrenals was found. In both cases the beard disappeared 2 months after delivery and the 17-ketosteroid excretion returned to normal.

The supposed antagonism between androgenic and estrogenic substances has led several investigators to study the effect of administration of the latter in women with heterosexual hair growth. Strassman (16) reports the results of 10 cases of hirsuties in women treated by the administration of estrogen and progesterone. Of the 10, 7 improved during the treatment and had a return of the hypertrichosis after the withdrawal of estrogen. Dunn (4) reports 11 cases of what he describes as a benign form a Cushing's syndrome which he treated for periods up to 4 years with progynon-B. In these there was regression of the hirsutism during the period of administration of the hormone but when treatment was interrupted there was an increase in the beard growth. Sevringhaus and Thornton (14) treated hirsuties in 14 women by the administration of gonadotropic hormones but obtained no diminution in beard growth by this therapy.

The use of androgens in substitution therapy in eunuchoidism has provided some data on the effect of these substances on the beard growth of males who previous to treatment had no facial hair. Finkler (5) treated 12 hypogonadal men with 5 mg. of methyl testosterone daily and noted that 6 of them developed slight beards. A similar result was obtained by Lievre (12) in the treatment of a 45 year old eunuchoid by implantation of 600 mg. of testosterone propionate under the skin of the abdomen.

Vest and Barelare (17) make the observation, however, that the treatment of hypogonadal males with androgens rarely results in the growth of facial hair until the administration has been continued several years and never does a thick beard develop. From-Hansen(17), in a study of the response of hypogonadal males to testosterone treatment, found that beard growth is not obtained until a level of 12,000 units of acid phosphatase per milliliter of prostatic secretion is reached although pubic hair is developed at a level of 2,000 units. For further discussion of the acid phosphatase in prostatic secretion as an indication of androgenic activity, the reader is referred to a paper by Kirk (11).

The treatment of certain types of gynecologic disorders (fibromata, dysmenorrhea) with androgens has provided an opportunity for observing the effect of these substances on the growth of facial hair in relatively normal females. Geist (8) treated 25 women between the ages of 16 and 37 and found that 11 per cent showed hypertrichosis of the chin and upper lip. All the individuals so affected had received above 500 mg. of testosterone. The beard developed within five to six weeks from the commencement of treatment. In another study Geist (9) treated 171 women with testosterone and reports that 23 developed facial hair. This stimulus to excessive hair growth was observed only in the women who received above 600 mg. of the hormone and of these 18 per cent grew beards.

Jöel (10), while treating 9 women with testosterone, noted marked growth of hair on the chin of one who had received 900 mg. of the hormone. Both of these investigators noted a regression of the beard soon after suspension of treatment. From a study of the previous cases it would appear that testosterone is more efficacious in stimulating beard production in the female than in the hypogonadal male, the hair growth in the former being observed much sooner and being more abundant.

Methods

The amount of beard produced daily was measured by shaving the face at intervals of twenty-four hours and weighing the shavings. A Schick electric razor having a single head was used. This type of razor has a collecting chamber in which the hair gathers and from which it can subsequently be removed without loss of any of the particles. While the patient was being shaved, a sheet of waxed cloth was placed around his neck and shoulders in order to collect any hairs which might fall from the razor. During the period of collection water alone was used to wash the faces of the patients in order to avoid possible accumulation of soap on the beard. The area to be shaved was delimited and the patients were shaved at the same hour by the same individual on 4 consecutive mornings. The beard obtained on the first morning was discarded and on the subsequent mornings was collected and weighed. From these 3 days the subjects average beard production was estimated.

Testosterone propionate in 25 mg. doses was then administered by injection 3 times weekly. The administration of testosterone was continued for eight weeks. Beard collection and measurement were carried out at the end of four weeks and again at the end of eight weeks' treatment.

Experimental

The investigation was carried out on 11 males ranging in age from 52 to 82 years. None of the subjects presented abnormalities of the beard or of other secondary sex characters.

The results of the determinations showed that the administration of testosterone produced a marked stimulus to beard growth. The average daily production of beard before treatment was 46 mg. It rose to 67 mg. after one month of androgen administration and to 71 mg. at the end of 2 months. The

Table 1. Daily Growth of Beard Before and After Testosterone Propionate Administration

No.	Age	24-hour Growth of Beard		
		Before Treatment Mg.	After 4 Weeks, Treatment Mg.	After 8 Weeks, Treatment Mg.
1	78	48	67	82
2	65	45	69	61
3	72	48	78	74
4	79	60	84	110
5	74	52	70	60
6	71	95	139	146
7	82	28	33	36
8	78	43	51	54
9	74	34	55	61
10	52	15	26	29
12	67	44	68	69
Mean for Group	72	46	67	71

individual response to testosterone is shown in table 1.

Examination of the figures shows that the greatest response is obtained in the first four weeks of treatment when the average increase for the group is 45 per cent, whereas in the second four weeks the average increase is only 10 per cent above the initial level and in 3 cases there was actually a slight decline. The percentage increases obtained in the individuals are shown in fig. 1.

EFFECT OF TESTOSTERONE INJECTION ON GROWTH OF BEARD

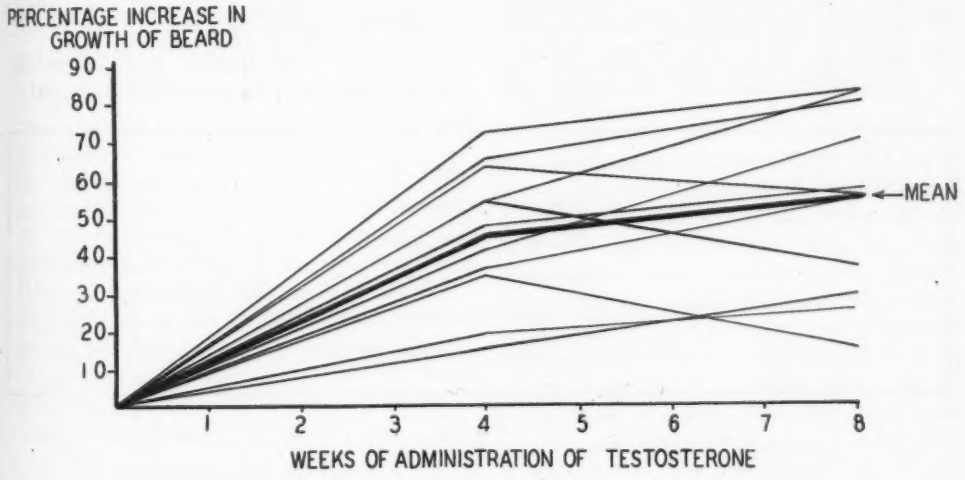

FIGURE 1.

It was thought that the age of the individual might influence the response to testosterone. A comparison of the percentage increase in individuals above 70 years with those below 70 years did show some difference between the two groups. The subjects below 70 years had an average increase of 57 per cent while the group above 70 increased only 38 per cent. The groups were too small to permit of statistical evaluation.

SUMMARY

A study was made of the effect of testosterone on the beard growth of 11 normal males between the ages of 52 and 82. Before hormone administration the average production per day was 46 mg. After four weeks treatment with three weekly injections of 25 mg. of testosterone propionate the average daily weight was 67 mg.

At the end of eight weeks treatment the average daily production was 71 mg. The greatest response was obtained in the first month when the average increase was 45 per cent. In the second month a further increase of 10 per cent was seen.

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REFERENCES

1. Bissel, G. W., and Williams, R. H.: Hirsutism in Females; Clinical Manifestations and Treatment. *Proc. Am. Federation Clin. Research, 1:* 38–39, 1944.
2. Danforth, C. H.: Physiology of Human Hair. *Physiol. Rev., 19:* 94–109, 1939.
3. Ducuing, J., and Benaygues: L'Hirsutisme avec Virilism par Tumeur Cortico-Surrenale. *Bull. Assoc. franç. p. l'étude du cancer, 29:* 122–163, 1940–1941.

4. Dunn, C. W.: The Cushing Syndrome. *Endocrinology, 22:* 374–385, 1938.
5. Finkler, Rita S.: Male Hypogonadism Treated by Sublingual Methyl Testosterone. *J. Clin. Endocrinol, 7:* 295–302, 1947.
6. Flynn, R.: Hirsutism of Adrenal Origin. *M. J. Australia, 1:* 11–19, 1947.
7. From-Hansen, P.: Ny Methode til Vurdering af Testes interne Sekretion hos Manden udfra Prostatasekretets Indhold af "sur" Fosfatase. *Bibliot. f. læger, 137:* 333–347, 1945.
8. Geist, S. H., Salmon, Udall J., Gaines, J. A., and Walter, R. I.: The Biologic Effects of Androgen in Women. *J. A. M. A., 114:* 1539–1544, 1940.
9. Geist, S. H.: Androgen Therapy in the Human Female. *J. Clin. Endocrinol. 1:* 154–161, 1941.
10. Jöel, C. A.: Methyl Testosterone in the Menopause. *J. Clin. Endocrinol., 2:* 116–119, 1942.
11. Kirk, E.: The Acid Phosphatase Concentration of the Prostatic Fluid in Young, Middle-Aged, and Old Individuals. *J. Gerontol., 3:* 98–104, 1948.
12. Lievre, J. A.: Implantation de Testosterone pour Eunuchisme. *Bull. et mém. Soc. méd. d. hôp. de Paris, 63:* 181–182, 1947.
13. Pedersen, Leth A.: Menneskets haarvæxt, spec. med henblik paa dens hormonale regulering. *Nord. med., 35:* 1751–1752, 1947.
14. Sevringhaus, E.L., and Thornton, M.J.: Clinical Uses of Gonadotropic Substances in Women. *Endocrinology, 17:* 123–127, 1933.
15. Stoddard, F. J.: Hirsutism in Pregnancy. *Am. J. Obst. & Gynec., 49:* 417–422, 1945.
16. Strassman, E. O.: Endocrine Treatment of Masculine Hair Growth in Women. *J. Internat. Col. Surgeons, 4:* 137–142, 1941.
17. Vest, S. A., and Barelare, B.: On Testicular Hypofunction. *Clinics, 1:* 1216–1240, 1943.

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Effect of Oral Administration of Vitamin A on Plasma Levels of Vitamin A and Carotene in Aged Males

MARVIN J. YIENGST AND NATHAN W. SHOCK

A SURVEY OF SERUM VITAMIN A AND CAROTENE FASTING LEVELS OF 126 MEN (40 TO 90 YEARS OF AGE) REVEALED NO DEMONSTRABLE CHANGE WITH AGE.

Few studies of serum vitamin A and carotene fasting levels in older individuals are available. Likewise not much is known of the tolerance curve obtained after oral administration of large amounts of vitamin A. The large range of values reported in the literature for fasting levels of these substances undoubtedly reflects the difficulties encountered in the analytic methods (2). It was felt that a more precise method might obviate these difficulties and at the same time supply more information for these values as a function of age.

Experimental Methods

Subjects: Subjects tested included 126 white and colored males between the ages of 40 and 90 years who were patients in the Baltimore City Hospitals and Infirmary (Old People's Home). All subjects were receiving a uniform adequate diet and were ambulatory. No one with a clinical history or signs of liver disease was included.

Experimental Procedure: All blood samples were drawn in the morning under fasting conditions for the determination of serum vitamin A and carotene levels.

Of the total group, 58 received orally 100,000 units of vitamin A in a fish liver oil concentrate following the withdrawal of the fasting blood sample. Additional blood samples for the determination of vitamin A and carotene were taken at 2, 4, 6, 8, 10, 16, and 24 hours following administration of the vitamin.

Analytical Methods: The method used was that of Bessey, Lowry, Brock, and Lopez (2) modified to accommodate larger samples. Eight to 10 ml. of venous blood were allowed to clot in red (low actinic) glass tubes and refrigerated until analyzed. All samples were analyzed within eighteen hours after withdrawal. Saponification and extraction were carried out under subdued light in 10 ml. glass stoppered centrifuge tubes using 2 ml. samples of serum. Readings were made on a model DU Beckmann quartz spectrophotometer at a wave length of 328 mμ for vitamin A and 460 mμ for carotene. Duplicate readings were made on each sample. Calculations were based on the extinction coefficients of Bessey, Lowry, Brock, and Lopez (2).

Results

Fasting serum vitamin A levels for the 126 subjects ranged from 10.2 to 88.5 micrograms per cent with a mean of 49.86 (S.D. dist. 14.07). Carotene values ranged from 28.3 to 244.0 micrograms per cent with a mean of 112.92 (S.D. dist. 43.31) (table 1). Twenty-nine of the subjects showed

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vitamin A levels below 40 micrograms per 100 ml. and 52 subjects had carotene levels below 100 micrograms per 100 ml. (figure 1). Examination of the data reveals no significant age trend for fasting levels of either vitamin A or carotene.

Oral administration of 100,000 U.S.P. units of vitamin A produced a marked increase of the serum levels in the 58 subjects tested. The mean curve for the change in plasma levels of vitamin A with time is shown in figure 2. The maximum increment in serum vitamin A levels was reached in from two to six hours with the exception of 1 subject who required eight hours. Of the entire group only 2 subjects failed to show less than a 100 per cent increase in plasma level.

The subjects were divided by age into 4 groups (40 to 59 yrs., 60 to 69 yrs., 70 to 79 yrs., and 80 to 89 yrs.) giving the values shown in table 2 and figure 3. There was no significant age trend in the maximum vitamin A blood level attained. There was a statistically significant increase in time required to attain maximum blood levels in subjects over 70 years of age (table 3, figure 3). The probability of this occurrence due to chance is less than 1 per cent (Chi-Square Test). It also appeared that the return to fasting levels was slower in the older than in the middle-aged group (col. 10, table 2).

Discussion

The lack of significant differences in fasting serum levels of vitamin A and carotene associated with age observed in this study are in agreement with the results of Kirk and Chieffi (3). The mean values reported by these investigators are significantly lower and show a greater standard deviation than the values of the present study. As an example for 60 to 69 year old males the aforementioned investigators reported a mean value of 27 ± 4.17 micrograms per 100 ml.

Table 1. Serum Fasting Levels of Vitamin A and Carotene by Age Groups

Age Group	No. of Subjects	Vitamin A			Carotene		
		γ %	σ Mn	σ d	γ %	σ Mn	σ d
40–49	15	47.58	2.45	9.48	126.71	10.84	41.95
50–59	14	54.97	5.22	19.52	128.31	11.36	42.49
60–69	45	49.87	2.03	13.60	110.97	6.71	44.53
70–79	29	47.14	2.77	14.90	106.00	7.36	39.67
80–89	23	51.67	2.65	12.72	107.10	9.58	45.98
40–89	126	49.86	1.26	14.07	112.92	3.87	43.31

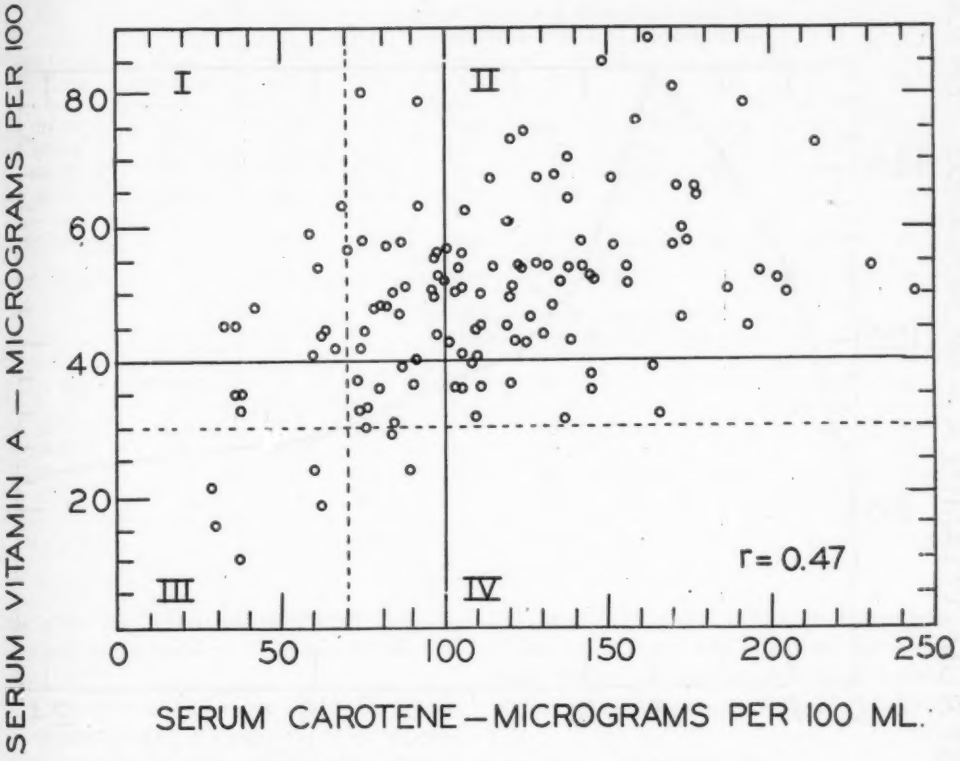

FIG. 1. Relationship between fasting blood serum values of vitamin A and carotene in mcg/100 ml. obtained on 126 middle-aged and elderly males.
Solid lines represent generally accepted values for lower limits of normal concentrations. The dotted horizontal line is the recommended minimum normal serum vitamin A level of Bessey (4). The dotted vertical line is a suggested minimum level for serum carotene.

of vitamin A as compared with 49.9 ± 2.03 micrograms per 100 ml. in the present study. The difference between these mean values is statistically significant (Difference /σ Difference = 4.1). The differences in these studies are either due to differences in sampling of subjects or differences in the analytic techniques.

Serum levels of 40 micrograms per 100 ml. for vitamin A and 100 micrograms per 100 ml. for carotene have been considered the lower limits of normal for these substances by various investigators (1, 4, 6). Using these criteria, 23 per cent of the subjects in our study showed a lowered vitamin A value (fig. 1); 41 per cent of the group had subnormal carotene levels. Of the group with normal vitamin A levels 34 per cent had subnormal carotene values (section I, figure 1) while only 15 per cent of those with normal carotene levels showed diminished vitamin A levels (section IV, figure 1). If the recommended value of 30 micrograms as the lower limit of normal for

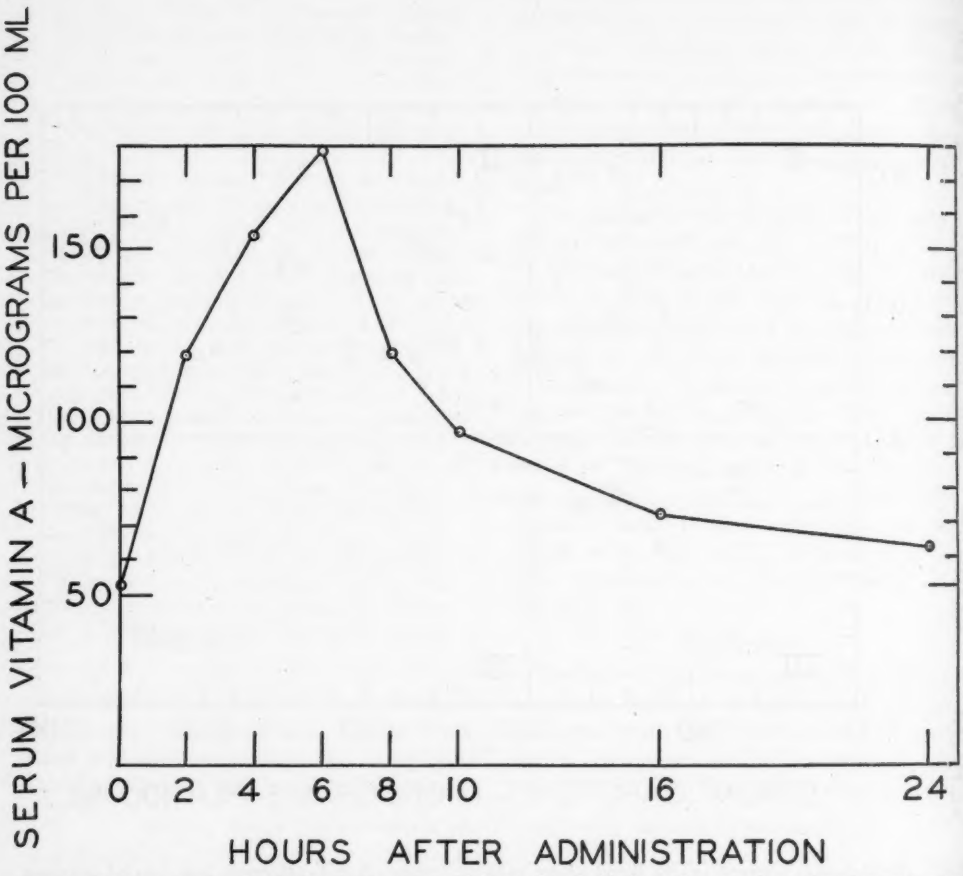

FIG. 2. Mean serum levels of vitamin A of 58 middle-aged and elderly males at various time intervals after oral administration of 100,000 units of vitamin A.

vitamin A with our method (4) is substituted, it will be seen that none of the subjects with normal carotene levels show a subnormal serum vitamin A value. There was a low positive correlation between vitamin A and carotene in these data ($r = 0.47$, $N = 126$) (figure 1).

The fallacy of establishing a value of 100 micrograms per 100 ml. as the minimum normal carotene value becomes apparent when mean normal values from the literature are examined. The data from other studies (3, 7, 8) were recalculated to obtain the standard deviation of the distribution. The mean values for other studies ranged from 123 to 130 micrograms carotene per 100 ml. with standard deviation ranging from 20 to 100 micrograms. Examination of the data showed that a considerable proportion of the subjects tested had values below 100 micrograms per 100 ml. If a tentative value of 70 micrograms per cent is accepted as representing the minimum normal then the number of subjects deficient in only one of these substances is lowered.

On the other hand, if one accepts rigid fixed values, then carotene may be significantly lowered before vitamin A. This oc-

TABLE 2. MEAN VITAMIN A PLASMA LEVELS OF 4 AGE GROUPS FOLLOWING THE ORAL ADMINISTRATION OF 100,000 UNITS OF VITAMIN A

Age Group in Years	No. of Subjects	Serum Vitamin A Micrograms per 100 ml. Hours After Vitamin A Administration							
		0	2	4	6	8	10	16	24
40–59	13	52.0	149.9	174.4	162.5	110.9	84.9	62.1	54.9
60–69	15	53.4	110.3	132.9	194.2	130.3	102.7	74.5	63.3
70–79	15	53.1	118.5	148.8	179.7	129.6	100.2	77.4	67.8
80–89	15	54.8	101.6	141.5	175.6	113.7	97.6	76.1	64.9
Mn (overall)		53.4	119.0	153.7	178.5	119.5	96.7	72.9	63.0

Age Group in Years	No. of Subjects	Serum Carotene Micrograms per 100 ml. Hours After Vitamin A Administration							
		0	2	4	6	8	10	16	24
40–59	13	109.9	102.8	105.8	104.5	104.1	95.7	93.8	99.4
60–69	15	125.3	116.6	111.6	117.7	113.3	116.1	117.9	130.4
70–79	15	122.7	129.2	127.3	127.2	129.6	132.7	118.9	136.2
80–89	15	110.9	101.1	98.4	100.9	115.4	114.2	105.0	109.1
Mn (overall)		117.4	112.7	111.0	112.9	116.1	115.3	109.7	119.5

currence has been demonstrated only in subjects maintained on a vitamin A deficient diet (9).

The possibility of more rapid absorption of vitamin A and its more rapid disappearance from the blood in middle-aged than in elderly subjects observed in this study is in agreement with results obtained in studies of children (4, 5) and adults (7). The maximum vitamin A blood level in 8 to 15 year old children was reached in five hours (4), in infants and children in from three to five hours (5), and in normal adults in three hours. (No determinations were made in this study between three and six hours.) (7).

TABLE 3. EFFECT OF AGE ON TIME OF MAXIMUM LEVEL IN SERUM VITAMIN A AFTER ORAL ADMINISTRATION OF VITAMIN A

Age In Years	Number of Subjects	Time of Maximum Increment	
		4 Hours or Less	Over 4 Hours
40–69	28	16	12
70–89	30	10	20

$\chi^2 = 7.21$
$P<1\%$

SUMMARY

The fasting mean serum vitamin A level for 126 males aged 40 to 90 was 49.9 micrograms per 100 ml. (S.D. dist. 14.07). The mean carotene level was 112.9 micrograms per 100 ml. (S.D. dist. 43.31). There was no demonstrable age change. The values observed for resting levels of vitamin A and carotene are significantly higher than those reported in elderly people by other investigators.

Oral feeding of 100,000 units of vitamin A produced a sharp rise in blood levels in from two to eight hours with a gradual lowering to within 20 per cent of the fasting levels in twenty-four hours unaccompanied by any changes in serum carotene.

There were no age differences in the

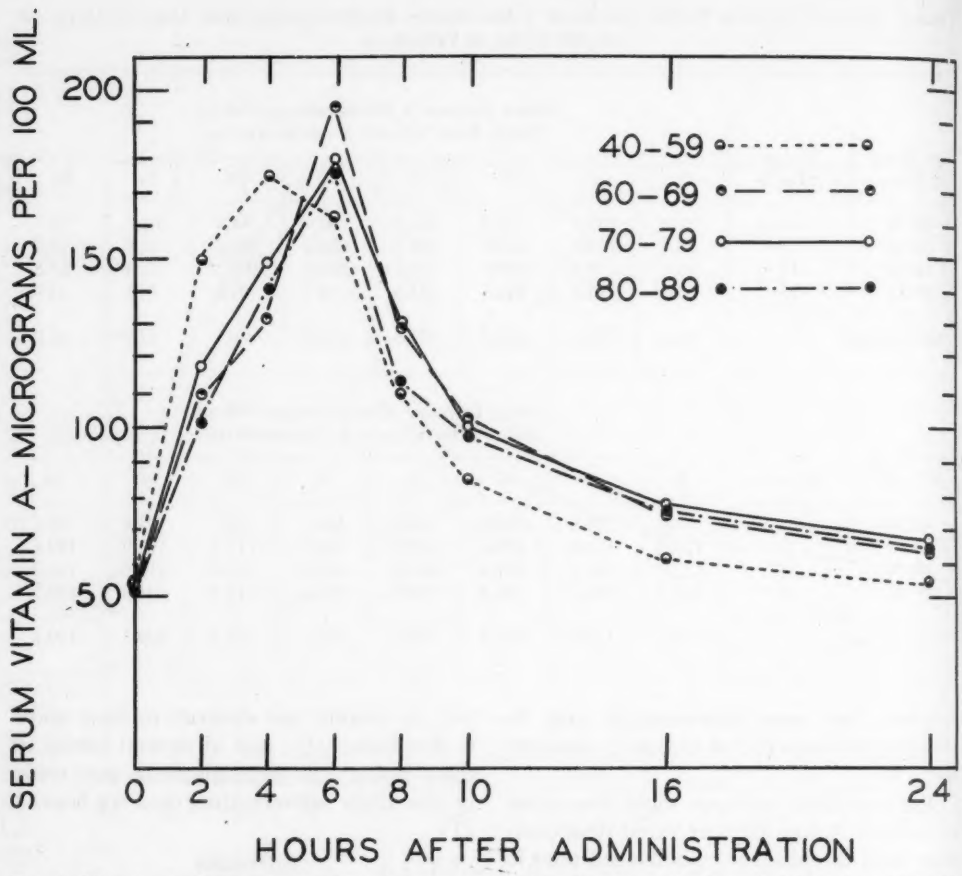

FIG. 3. Vitamin A tolerance curves of 4 age groups at various time intervals after administration of 100,000 units of vitamin A.

o·····o 13 subjects aged 40-59 yrs; o— — — o 15 subjects aged 60-69 yrs;
o————o 15 subjects aged 70-79 yrs; •—·—·—• 15 subjects aged 80-89 yrs.

maximum serum levels of vitamin A attained after oral administration. There was some tendency for the maximum blood level to be obtained slightly earlier in the younger group (40 to 70) than in the group over age 70. This difference was statistically significant.

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REFERENCES

1. Aldersberg, D., Sobotka, H., and Bogatin, B.: Effect of Liver Disease on Vitamin A Metabolism. *Gastroenterology, 4:* 164–174, 1945.
2. Bessey, O. A., Lowry, O. H., Brock., M. J., and Lopez, J. A.: Determination of Vitamin A and Carotene in Small Quantities of Blood Serum. *J. Biol. Chem., 166:* 177–188, 1946.
3. Kirk, E., and Chieffi, M.: Vitamin Studies in Middle-Aged and Old Individuals. I. The Vitamin A, Total Carotene and $\alpha+\beta$ Carotene Concentration of Plasma. *J. Nutrition, 36:* 315–322, 1948.
4. Krause, R. F., and Pierce, H. B.: Blood Levels and Absorption of Vitamin A in Children with

and without Keratosis Follicularis. *J Nutrition, 33:* 633–640, 1947.

5. May, C. D., Blackfan, K. D., McCreary, J. F., and Allen, F. H., Jr.: Clinical Studies of Vitamin A in Infants and Children. *Am. J. Dis. Child., 59:* 1167–1184, 1940.
6. Rafsky, H. A., Newman, B., and Jolliffe, N.: A Study of the Carotene and Vitamin A Levels in the Aged. *Gastroenterology, 8:* 612–615, 1947.
7. Ralli, E. P., Bauman, E., and Roberts, L. B.: The Plasma Levels of Vitamin A after the Ingestion of Standard Doses. Studies in Normal Subjects and Patients with Cirrhosis of the Liver. *J Clin. Investigation, 20:* 709–713, 1941.
8. Robinson, A., Wesher, M., Harrison, A. P., Moyer, E. Z., Gresock, M. C., and Saunders, C.: Nutritional Status of Children. VI. Blood Serum, Vitamin A and Carotenoids. *J. Am. Dietet. A., 24:* 410–416, 1948.
9. Steigmann, F., and Popper, H.: Influence of Large Doses of Vitamin A upon the Plasma Vitamin A Level. *Am. J. Med. Sci., 207:* 468–476, 1944.

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The Correlation Between Thyroid Function and the Incidence of Arteriosclerosis

Esben Kirk, Margaret Chieffi, and W. B. Kountz

That a low metabolic rate tends to be connected with calcification of the popliteal and intermetatarseal arteries is demonstrated by this study of 118 persons and suggests that the function of the thyroid gland is a factor in the development of medial arteriosclerosis.

Observations from animal experiments in recent years have indicated an inverse relationship between the degree of activity of the thyroid gland and the susceptibility of the vascular system to intimal atheromatosis. Although the frequency of arteriosclerotic lesions in patients with frank myxedema has been recognized for more than fifty years, investigations in human individuals on the correlation between thyroid function and the incidence of arteriosclerosis in nonmyxedematous conditions have been rather scarce and have from necessity been limited chiefly to an evaluation of the degree of medial arteriosclerosis as evidenced by roentgenologic demonstration of calcification of the peripheral arteries and the finding of increased width of the aortic shadow.

A study on the correlation between the basal metabolic rate and the incidence of arteriosclerosis was published in 1942 by Bruger and Rosenkrantz (2). In this investigation, which included 293 individuals above the age of 55, a reduction of the metabolic rate to below—10 per cent was found in 32 per cent of the subjects who presented clinical signs and symptoms of arteriosclerosis, but in only 10 per cent of those in whom arteriosclerosis was not demonstrated. The results of an investigation on the correlation between the serum cholesterol concentration and the incidence of cardiac enlargement and widening of the aortic shadow were reported in 1948 by Ungerleider and Gubner (7) who compared 104 persons with blood cholesterol levels below 175 mg. per cent and 104 subjects with cholesterol concentrations above 265 mg. per cent. No certain difference in the incidence of arteriosclerosis was observed between the two groups.

The present investigation was undertaken to study more closely the correlation between thyroid function and arteriosclerosis by including, besides determination of basal metabolic rate and serum cholesterol, an estimation of the serum protein-bound iodine concentration for evaluation of thyroid activity.

Experimental

The investigation included 118 subjects, 65 men and 53 women between 45 and 96 years of age, most of whom were inmates of the St. Louis City Infirmary Hospital. Patients with Graves' disease, myxedema, hypertension, nephritis, cardiac failure, diabetes, syphilis, and patients who had received iodide or thyroid medications were excluded from the study.

Determination of serum protein-bound iodine was made by the procedure of Chaney

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His primary fields of research have been in clinical medicine and biochemistry. He is a member of the American and Danish Gerontological Societies and the Danish Society for Internal Medicine, a member of the Harvey Society, and a Fellow of the Royal Society of Medicine, England.

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Dr. Kountz received his M.D. degree from Washington University in 1926 and served for a year as intern at Barnes Hospital and three as assistant and instructor at the Washington University School of Medicine. After a year in Egypt, England, and Germany as National Research Council Fellow, he returned to the Washington University School of Medicine as instructor and became Assistant Professor of Clinical Medicine in 1939. He is also connected with the Division of Gerontology at that University as Director of Clinical Services and is consulting physician to Barnes Hospital, Lutheran Hospital, and St. Louis City Infirmary Hospital. He is a member of the Society for Clinical Investigation, the Central Society for Clinical Research, and the Gerontological Society, and his chief interests are geriatrics and cardiovascular diseases.

(3) in the modification of Taurog and Chaikoff (6) The difficulties inherent to this method and the average error of the analysis have been discussed in a previous publication (4) which also contains data on the effect of age on the serum iodine level in men and women. The basal metabolic rate determinations were performed by means of a Sanborn apparatus, the reliability of which was ascertained by alcohol combustion checks. In order to obtain complete relaxation during the test .09 gm. of seconal was given to the older patients at midnight. For serum cholesterol estimation a modification of Bloor's (1) procedure was used.

The presence of arteriosclerosis was ascertained by roentgenograms of the popliteal and intermetatarseal arteries, by palpation of the brachial and radial arteries, and by teleoroentgenograms of the heart and great vessels. The width of the aortic shadow in the teleoroentgenograms was measured as described by Sante (5). For determination of the cardiac area in percentage of normal the directions given by White (8) were followed.

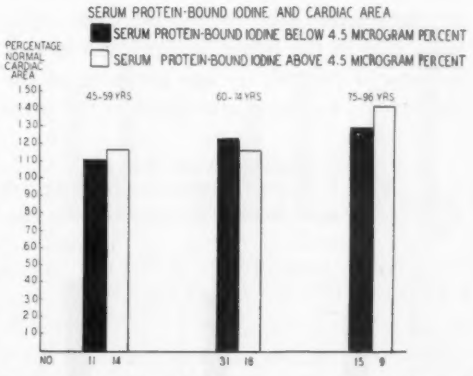

FIG. 1. Correlation between serum protein-bound iodine and cardiac area.

Cardiac area.—The correlation between the serum protein-bound iodine concentration and the size of the cardiac area (expressed in percentage of normal) is presented in figure 1. The figure fails to show any

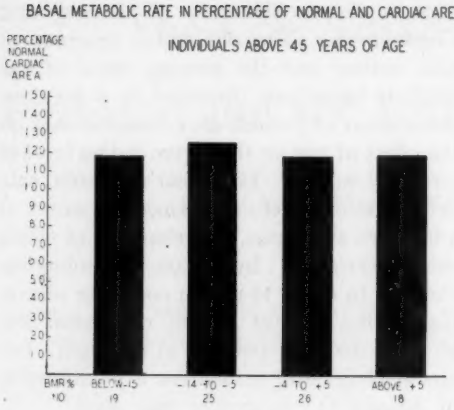

FIG. 2. Correlation between basal metabolic rate and cardiac area.

consistent correlation between the two sets of values, but, as might have been expected, demonstrates a definite increase in cardiac area with advancing years. This increase in cardiac area with age is evidenced by a comparison of the height of the three sets of columns in the figure.

A comparison of the basal metabolic rate and the cardiac area likewise failed to reveal any correlation (fig. 2). As the basal metabolic rate in the figure is expressed in percentage of normal, no age grouping of the individuals has been attempted in the presentation of the data. As will be seen from figure 3, in the present series of investigations no correlation was found to exist between the serum cholesterol level and the observed cardiac area. This latter observation is in good agreement with the conclusions by Ungerleider and Gubner mentioned in the introduction.

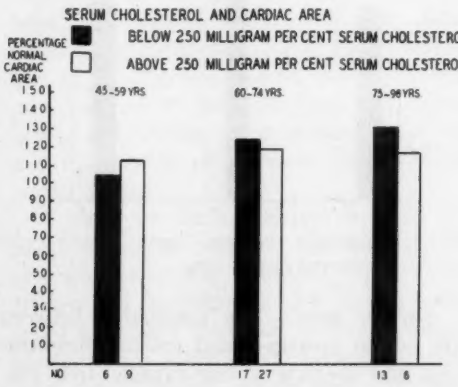

FIG. 3. Correlation between serum cholesterol and cardiac area.

Aortic shadow.—The correlation between serum protein-bound iodine and the diameter of the aortic shadow is presented in figure 4. The data show a tendency for the lower iodine values to be associated with higher values for the aortic diameter. That this difference is not statistically significant, however, can be evidenced by applying the t-test to the three sets of data, which gives values for the critical ratios as low as 0.4, 0.9, and 1.1. The influence of age on the width of the aortic shadow is, on the other hand, well illustrated by the observed increase of the diameter from an average value of 5.6 cm. in the 45 to 59 year age group to a mean value of 7.0 cm. in the individuals 75 years of age and older.

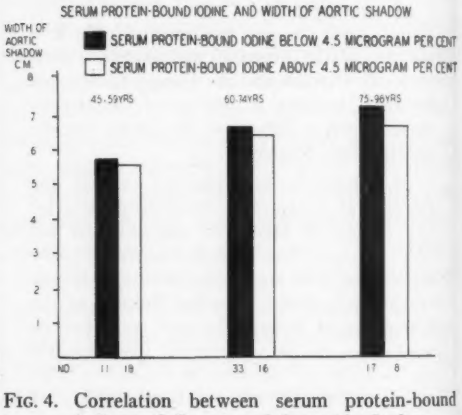

FIG. 4. Correlation between serum protein-bound iodine and diameter of the aortic shadow.

In the following figure (fig. 5) the observed mean values for the aortic shadow have been plotted against the basal metabolic rate (expressed in percentage of normal). The findings show a definite inverse correlation between the two sets of data, the

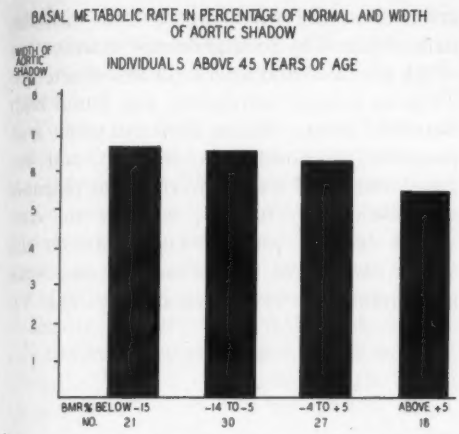
BASAL METABOLIC RATE IN PERCENTAGE OF NORMAL AND WIDTH OF AORTIC SHADOW
INDIVIDUALS ABOVE 45 YEARS OF AGE
WIDTH OF AORTIC SHADOW CM
BMR% BELOW -15
-14 TO -5
-4 TO +5
ABOVE +5
NO. 21 30 27 18

FIG. 5. Correlation between basal metabolic rate and diameter of the aortic shadow.

patients with a low basal metabolism having a wider aortic shadow than the individuals with a normal caloric metabolism. This fact is also well brought out by a calculation of the coefficient of correlation between the basal metabolic rate and the aortic diameter, which was found to be —0.37 (t-test of significance, 3.9).

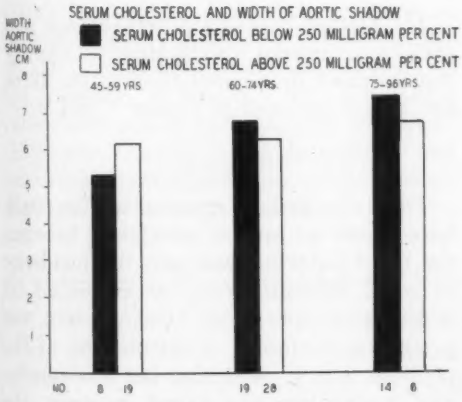
SERUM CHOLESTEROL AND WIDTH OF AORTIC SHADOW
SERUM CHOLESTEROL BELOW 250 MILLIGRAM PER CENT
SERUM CHOLESTEROL ABOVE 250 MILLIGRAM PER CENT
WIDTH AORTIC SHADOW CM
45-59 YRS
60-74 YRS
75-96 YRS
NO 8 19 19 28 14 6

FIG. 6. Correlation between serum cholesterol and diameter of the aortic shadow.

As will be seen from figure 6 no consistent correlation was found between the serum cholesterol concentration and the diameter of the aortic shadow.

Peripheral arteriosclerosis.—The incidence of calcification of the popliteal artery and of the intermetatarseal arteries was examined in 62 and 111 persons respectively. For reasons not relevant to the study popliteal roentgenograms were not obtained for the subjects in the age group 45 to 59 years. In the patients in whom roentgenograms of both the knee region and the foot were provided the incidence of calcification proved to be higher in the popliteal than in the intermetatarseal arteries (84 and 72 per cent respectively). This greater tendency to calcification in the popliteal artery is further illustrated by the fact that no case of intermetatarseal arteriosclerosis was observed which was not associated with popliteal calcification.

The correlation between serum protein-bound iodine and popliteal and intermetatarseal calcification is demonstrated in figure 7. The data show a greater tendency for the

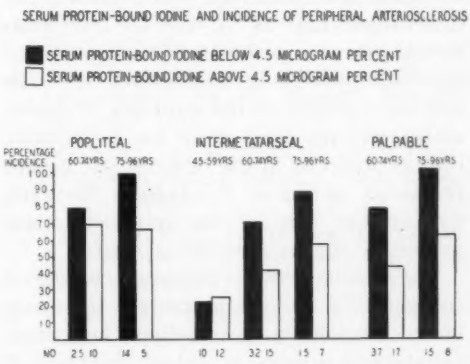
SERUM PROTEIN-BOUND IODINE AND INCIDENCE OF PERIPHERAL ARTERIOSCLEROSIS
SERUM PROTEIN-BOUND IODINE BELOW 4.5 MICROGRAM PER CENT
SERUM PROTEIN-BOUND IODINE ABOVE 4.5 MICROGRAM PER CENT
PERCENTAGE INCIDENCE
POPLITEAL
INTERMETATARSEAL
PALPABLE
60-74YRS 75-96YRS
45-59YRS 60-74YRS 75-96YRS
NO 25 10 14 5 10 12 32 15 15 7 37 17 15 8

FIG. 7. Correlation between serum protein-bound iodine and incidence of peripheral arteriosclerosis.

lower than for the higher serum iodine values to be associated with arterial calcification. The strength of this correlation, although suggestive, can not be considered as conclusive since the critical ratio for only one of the sets of groups reaches a value of 2.3. A significant correlation was observed, however, between the basal metabolic rate and the incidence of calcification of the popliteal

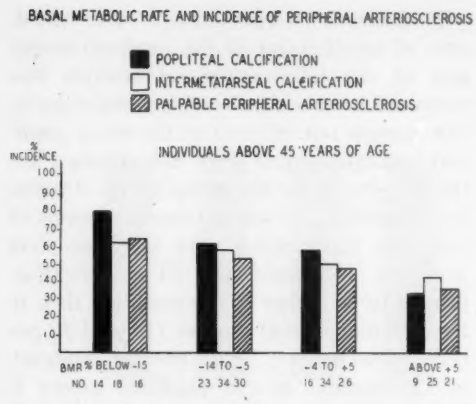

FIG. 8. Correlation between basal metabolic rate and incidence of peripheral arteriosclerosis.

artery (fig. 8). Thus a comparison of the percentage frequency of calcification in the subjects with basal metabolic rates of —15 per cent or below and with metabolic rates above + 5 per cent shows values of 80 and 30 per cent respectively, which gives a critical ratio as high as 2.7. For the intermetatarseal arteries on the other hand a similar calculation reveals a value of only 1.4. The consistent change in the incidence of calcification with the level of the basal metabolic rate as observed in the intermediate groups presented in figure 8 suggests, however, that in the case of the intermetatarseal arteries a similar correlation exists.

The relation between the serum cholesterol concentration and the percentage frequency of calcification in the popliteal and intermetatarseal arteries is shown in figure 9. As evidenced from the figure no correlation was found to exist between the serum cholesterol concentration and the occurrence of peripheral arterial calcification except possibly in the oldest group of individuals where the incidence of both popliteal and intermetatarseal calcification was smaller in the patients presenting the higher cholesterol values (critical ratios 2.3 and 2.3).

The observations on the incidence of peripheral arteriosclerosis as demonstrated by palpation of the radial and brachial arteries on the whole agree well with the data obtained by roentgenologic examination of the popliteal and intermetatarseal arteries. Thus an inverse correlation was found both between serum iodine concentration and palpable arteriosclerosis (fig. 7) and between the basal metabolic rate and palpable arteriosclerosis (fig. 8), whereas no consistent relation was observed between the serum cholesterol values and the incidence of palpable arteriosclerotic changes (fig. 9).

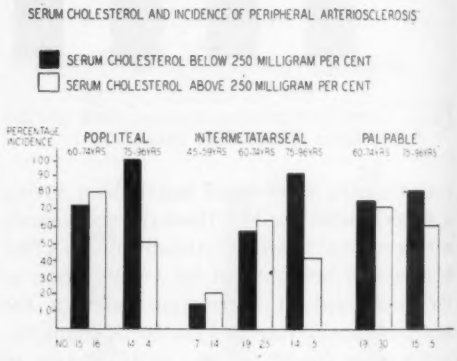
SERUM CHOLESTEROL AND INCIDENCE OF PERIPHERAL ARTERIOSCLEROSIS
SERUM CHOLESTEROL BELOW 250 MILLIGRAM PER CENT
SERUM CHOLESTEROL ABOVE 250 MILLIGRAM PER CENT
PERCENTAGE INCIDENCE
POPLITEAL
60-74YRS 75-96YRS
INTERMETATARSEAL
45-59YRS 60-74YRS 75-96YRS
PALPABLE
60-74YRS 75-96YRS
NO. 15 16 14 4 7 14 19 25 14 5 19 30 15 5

FIG. 9. Correlation between serum cholesterol and incidence of peripheral arteriosclerosis.

The marked correlation between age and peripheral arterial calcification is clearly demonstrated by a comparison of the three age groups included in figures 7 and 9.

DISCUSSION

The investigations reported in this study have shown an inverse correlation between the basal metabolic rate and the incidence of aortic arteriosclerosis (as evidenced by widening of the aortic shadow) and the percentage frequency of calcification of the popliteal artery. A similar but less conclusive correlation was found between the serum protein-bound iodine concentration and the incidence of peripheral arteriosclerosis. The reason for the slighter degree of correlation observed between the organic serum iodine level and the incidence of peripheral arteriosclerosis may possibly be

sought in the technical difficulties with which the serum iodine analysis is still endowed in spite of the strictest supervision of the technique.

When the findings are considered as a whole the results suggests an influence of the thyroid gland on the development of medial arteriosclerosis in human subjects. That other factors may be of greater significance is exemplified by the much higher correlation existing between age and arteriosclerosis than between basal metabolic rate (and serum organic iodine) and arteriosclerosis. Thus a comparison of the 45 to 59 and the 75 to 96 year age groups shows an incidence of intermetatarseal arteriosclerosis of 22 and 78 per cent respectively (critical ratio 4.5), whereas the differences in the frequency occurrence of peripheral arterial calcification between individuals with low and high basal metabolic rates and low and high serum iodine values within the same age group never reach this magnitude.

Summary

A study of the correlation between serum protein-bound iodine, basal metabolic rate, serum cholesterol, and the incidence of peripheral and central medial arteriosclerosis in 118 persons between 45 and 96 years of age revealed a tendency for low iodine values and reduced metabolic rate to be associated with calcification of the popliteal and intermetatarseal arteries and with increased diameter of the aortic shadow.

No certain relationship was observed between the serum cholesterol concentration and the clinically demonstrable incidence of medial arteriosclerosis.

The findings suggests an influence of the thyroid gland on the development of medial arteriosclerosis in human subjects.

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References

1. Bloor, W. R.: The Determination of Small Amounts of Lipid in Blood Plasma. *J. Biol. Chem., 77:* 53–73, 1928.
2. Bruger, M., and Rosenkrantz, J. Q.: Arteriosclerosis and Hypothyroidism: Observations on Their Possible Relationship. *J. Clin. Endocrinol., 2:* 176–180, 1942.
3. Chaney, A. L.: Improvements in Determination of Iodine in Blood. *Ind. and Eng. Chem., Anal. Ed., 12:* 179–181, 1940.
4. Kountz, W. B., Chieffi, M., and Kirk, E.: Serum Protein-bound Iodine and Age. *J. Gerontol., 4:* 132–135, 1949.
5. Sante, L. R.: *Principles of Roentgenological Interpretation.* 5th Ed., Edwards Brothers, Ann Arbor, 1944.
6. Taurog, A., and Chaikoff, I. L.: On the Determination of Plasma Iodine. *J. Biol. Chem., 163:* 313–322, 1947.
7. Ungerleider, H. E., and Gubner, R.: Clinical Significance of Blood Cholesterol. *Am. Heart J., 36:* 469, 1948.
8. White, P. D.: *Heart Disease.* 3rd Ed., Macmillan Company, New York, 1946.

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Animism and Related Tendencies in Senescence

WAYNE DENNIS AND BETTY MALLINGER

AN INVESTIGATION OF THE ANIMISTIC TENDENCIES OF 36 PEOPLE 70 YEARS OF AGE AND OLDER DISCLOSED THAT 75 PER CENT GAVE ANSWERS WHICH CAN BE CONSIDERED THOSE OF A CHILDHOOD LEVEL OF DEVELOPMENT. EVEN WHEN ALLOWANCES ARE MADE FOR DIFFERENT EDUCATIONAL LEVELS DR. DENNIS AND MISS MALLINGER BELIEVE THIS REPRESENTS A DEFINITE REGRESSION TO CHILDHOOD CONCEPTS.

THAT old people are childish was a popular belief long before there were any investigations of senescence. The childishness referred to probably includes a combination of forgetfulness, slowness of comprehension and action, and emotional immaturity. Relatively recent researches have clearly shown the correctness of the impression that in many respects there is a return in old age to childhood levels of competence.

The aim of the present paper is to present a report of some preliminary research into the status of senescents in regard to some of the concepts of children which have been investigated by Piaget (3) and others. Piaget has shown that the young child when he can first give consistent expression to his ideas attributes life, awareness, feeling, and purpose to all objects which are able to serve their normal functions. In the young child's opinion, only broken or damaged or destroyed objects are unable to feel, to know where they are and what they are doing, and only these are dead. As the child grows older these ideas change, children's concepts of what is living and what is conscious fall in almost all cases into four categories. These categories Piaget has called stages, and he proposes that each normal individual passes through three stages and reaches stage four. In stage 1, anything which is useful is living; broken and damaged objects are dead. In stage 2, only objects which move or which are active in some way are alive; they are alive whether moved by themselves or moved by some other force. In stage 3, objects must be self-moved in order to be considered living. In stage 4, only plants and animals are considered to be living; consciousness is usually thought of as limited to animals.

The present study employed a standardized form of Piaget's procedure devised by Russell and Dennis (7) and previously applied to several thousand persons. (1, 2, 4, 6, 8). The subjects of the present study were 36 people, 70 years of age or older. Eighteen were in the seventies, 14 were in the eighties, and 4 were 90 years of age or older. All were from 3 homes for old people which are located in Pittsburgh. Women composed the majority of the group, only 8 of the 36 being men. Of the total subjects, only one did not have an eighth-grade education or its equivalent; 18 had completed only the elementary grades; 17 had education beyond grammar school. Only five were foreign born; 22 of the native born were born in Pennsylvania. All were of the white race. Practically all belonged to the group sometimes designated as old-American; that is, they were Protestants of North European descent whose ancestors had been in America for several generations.

In order to obtain a rough indication of the former ability of the subjects, the Terman-Merrill vocabulary test was adminis-

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He has published various books on psychology and is interested in the investigation of childrens' concepts. Some of this work has been done among the Hopi and Zuni Indians as well as among white American children.

Miss Betty Mallinger received her B.S. degree from the University of Pittsburgh in 1947 and her M.S. degree in 1948. She will be a candidate for a Ph.D. degree in September, 1949. During most of her graduate career she has been an assistant in research.

tered to each. Two subjects scored at the 14 year age level; all others scored at the adult or superior adult levels (22 of the 36 were in the superior adult II and III groups). In general, this evidence would indicate practically every member of the group at one time had an I. Q. of 100 or higher.

While we expected to find some animism in these subjects, the degree of animism found was wholly unexpected. Only 9, or 25 per cent, were in stage 4; that is, 75 per cent gave answers which were classified as immature.

These answers were frequently identical with those given by children (3, 4). For instance, among the 12 subjects who were scored as being in stage one, we find the following answers: The chair is living because it is of use; the mirror is living because you can see yourself in it; the knife is living because it cuts and performs work; the dish (broken) is dead because it is of no use or it is living because it can be mended and can be fixed up. Among the 7 subjects in stage two, we find the following responses: The clouds are living because they travel, the wind moves them; the river is living because it has motion, the motion is created by the elements. In another instance, the river is living and is moved by gravity; the wind is alive if it is blowing.

Stage 3 answers, too, are like those previously recorded for children. For instance, the river is living because it moves by itself, lightning is alive because it does devilment; clouds are living because they produce water and absorb water. Any differences between the answers given by these old people and those given by children seem to arise from the greater vocabulary and the greater mastery of language in the aged. Thus an 81 year old woman said that the stone was living "because it has never been crushed or broken. It's in its natural state," had an idea characteristic of young children but expressed it more elegantly.

In regard to the attribution of consciousness (5), 47 per cent of the subjects were in stage 4, that is, 53 per cent attributed the ability to know or to feel to certain inanimate objects. It will be noted that the proportion of subjects giving immature answers is less in the case of consciousness than in the case of animism. This is in accord with the results found by Russell in regard to older children. Ten and 12-year-olds have given up the attribution of consciousness to objects to a greater extent than they have given up the attribution of life.

The data just presented show that many of our subjects gave answers which Piaget would classify as immature; that is, the majority of the subjects were not in the so-called adult stages. It should be borne in mind, however, that while Piaget labels certain answers as adult, no one has examined a random sample of adults to find how many of them think that objects other than plants and animals are alive and that objects other than animals have conscious experiences. It

is possible that many adults of normal intelligence are not in Piaget's stage 4. We are inclined to believe that this is the case.

We do not believe, however, that a group of 20 or 30 year old people will have as small a percentage of stage 4 subjects as our present sample. This judgment is based on several pieces of evidence. In the first place, Russell has reported on a group testing for animism in 600 high school pupils (6). Of those, at mental age level 14 to 16, 75 per cent were in stage 4. Russell, Dennis, and Ash (8) examined by the same method used in this study more than 100 institutionalized feeble-minded subjects over 21 years of age. Of those with a mental age of from 8 to 10 years, 43 per cent were in stage 4. It will be recalled that only 25 per cent of our present subjects were in stage 4; yet none of our subjects had ever been classified as feeble-minded. In regard to the attribution of consciousness, our present group have a record slightly poorer than the 12 to 14 year old school children examined by Russell. In other words, even though the normal adult may have some animism and related tendencies, our subjects are inferior in their concepts even to 12 to 14 year old children.

This type of comparison is not completely conclusive because the childhood and the education of our present subjects occurred so long ago, in many cases before 1885. Although 12 to 14 year old children make somewhat better records than did our group of septagenarians and octogenarians, the difference between the young and the old may, of course, be due to factors other than age, such as education.

Differences within our own group have some bearing on this matter of interpretation. Half of our group were in the seventies; half were 80 years of age or older. Of those in the seventies, 39 per cent were in stage 4 in animism, 61 per cent were in stage 4 in regard to the attribution of consciousness. In the older group, the comparable percentages are only 11 per cent and 33 per cent. These differences do not quite reach the 5 per cent level of confidence. More cases should be added to our series but there is some evidence that even within the 23 year age range of our subjects there is a marked change in animism. It must be kept in mind that these two age groups have been subject to the same cultural and historical influences for seventy years. It seems unlikely that the differences between the 70 year old and the 80 year old persons trace back to the early years of their long lives.

It seems more likely that they are due to the greater neurologic deterioration of the octogenarians. The meager data which has been presented here suggest the desirability of a more extensive comparison of the seventh and eighth decades of life.

Summary

It has been shown that procedures for the investigation of animism and related tendencies which have been used with children are applicable in senescence. Very similar answers are given by children and by the aged. Only a minority of the subjects gave what have been called adult answers. Even when allowance is made for inadequate adult norms, it seems likely that animistic concepts in the subjects greatly exceed those in early maturity. While the evidence is not conclusive, it is interpreted that these results are due to a return in senescence to childhood concepts. This change is presumably due to the decline in mental ability which accompanies senility.

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References

1. Dennis, W.: Animism and Related Tendencies in Hopi Children. *J. Abnorm. and Sociol. Psychol., 38:* 21–36, 1943.
2. Dennis, W., & Russell, R. W.: Piaget's Questions Applied to Zuni Children. *Child Development, 11:* 181–187, 1940.
3. Piaget, J.: The Child's Conception of the World. Harcourt, Brace, New York, 1929.

4. Russell, R. W.: Studies in Animism: II. The Development of Animism. *J. Genet. Psychol., 56:* 353–366, 1940.
5. Russell, R. W.: Studies in Animism: IV. An Investigation of Concepts Allied to Animism. *J. Genet. Psychol., 57:* 83–91, 1940.
6. Russell, R. W.: Studies in Animism: V. Animism in Older Children. *J. Genet. Psychol., 60:* 329–335, 1942.
7. Russell, R. W., & Dennis, W.: Studies in Animism: I. A Standardized Procedure for the Investigation of Animism. *J. Genet. Psychol., 55:* 389–400, 1939.
8. Russell, R. W., Dennis, W., and Ash, F. E.: Studies in Animism: III. Animism in Feeble-minded Subjects. *J. Genet. Psychol., 57:* 57–63, 1940.

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Endocrine Gerontotherapy

The Use of Sex Hormone Combinations in Female Patients

HARRY BENJAMIN

ON THE THEORY THAT ENDOCRINE DEFICIENCIES ALWAYS ACCOMPANY THE AGING PROCESS DR. BENJAMIN ADMINISTERED GONADAL HORMONES TO 88 WOMEN AGED 43 TO 73 AND OBTAINED GOOD RESULTS WITH A COMBINED INJECTION OF ANDROGEN AND ESTROGEN, THE PROPORTION VARYING ACCORDING TO THE INDIVIDUAL PATIENT.

GERONTOTHERAPY indicates the treatment of the aging process itself, apart from the medical care for any accompanying diseases. The latter belongs to the field of geriatrics. It is the aim and purpose of gerontotherapy to add at least a few years of active and useful living to old age. The quality of life, not its length is the chief consideration.

Long life is not necessarily a blessing. Extended existence on a low level of vitality is an affliction. The inevitable end best occurs quickly with a rapid decline from a reasonably high level. A purely sentimental attitude toward old age and death should make way for a realistic approach which is not only more logical and scientific, but also more humanitarian.

Gerontotherapy (1) in its present state is not the ultimate solution to these problems. It is merely a modest beginning to obtain healthier old people when—so far—modern medicine is only responsible for more old people.

Endocrine deficiencies always accompany the aging process. These deficiencies are probably to a large extent responsible for the time of the onset of old age and for the character and the severity of its infirmities. Loeb (6), Korenchevsky (5), and others have expressed similar thoughts.

Endocrine gerontotherapy therefore is at present the first method to be considered in the clinical management of the aging and old individual. This endocrine therapy is to be supplemented by other measures, for instance vitamin and mineral medication, diet, psychotherapy, and also by geriatric treatments whenever they are indicated.

Among the endocrine remedies, the steroid sex hormones are of outstanding value on account of their anabolic effects. Testosterone propionate seems to be of special significance and importance for both sexes because it promotes protein metabolism and induces protein formation and retention, giving increased muscular strength to the aging male as well as female. These gonadal hormones are therefore more than sex hormones, as they have definite influence on nonsexual organs.

The use of combinations of androgen, estrogen, progesterone, and occasionally the cortical hormone, as well as the gonadotropins of the pituitary, the combinations prepared according to symptoms and constitutional factors, has other reasons than those that were behind the antiquated treatment with polyglandular preparations. That so-called shotgun therapy was principally justified through the assumption that glandular deficiencies were almost always of a polyglandular nature. The products used at that time had no known potency, but

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when endocrinology outgrew its infancy and reached its present status, new and different conceptions began to determine therapy.

The recent idea of combining steroid gonadal hormones (and others) has pharmacodynamic, as well as constitutional reasons. Their combined anabolic actions seem to offer greater therapeutic possibilities and especially so in old age. Besides, the so-called male and female hormones exist normally in both sexes. They vary in their proportions, molding a person's constitution and influencing all vital functions, physical as well as mental.

The idea of using sex hormone combinations seemed especially logical in gerontotherapy on account of their favorable metabolic effect on all tissues. Senile tissue atrophy can thus be counteracted. The successful administration of androgens and estrogens in senile osteoporosis, as reported by Reifenstein and Albright (10), is a striking example.

A further reason for adding testosterone to estrogen in the treatment of women is its balancing effect by which estrogen bleeding may be prevented. Margolese (7) has reported striking experiences in this respect. Greenblatt (4) concurs in this opinion and mentions other indications for combining testosterone with estrogen, for instance, breast pain, abdominal bloating, frequency of urination, and restoration of libido. All these observations were likewise made in the series of cases reported in this paper.

Another thought, unsupported as yet but perhaps true and worthwhile considering, is that androgen in women may prevent cancer formation or counteract such tendency in those organs where estrogen would favor it. Similarly the addition of estrogen to testosterone in men may be justified to forestall the development or growth of prostatic cancer.

There are numerous references in the international medical literature to the use of androgens with estrogens for various conditions, for instance, cardiovascular disease (12) (especially angina), otosclerosis, menopause, mastopathia. But the treatment has usually been given by alternating injections of androgens and estrogens. This may not be quite the same as the simultaneous administration as used in this study.

In all cases reported here the respective steroid hormones were mixed in the same syringe and injected into the gluteal muscles. Table 1 lists 58 cases of aging without menopausal symptoms and table 2 30 cases with menopausal complaints. The menopause is considered an endocrine manifestation of the aging process and therefore a typical indication for endocrine gerontotherapy.

The aging process is the principal indication and gerontotherapy is the main purpose in all tabulated cases. Other indications and symptoms are listed as contributory, but only those that appeared prominent in the clinical picture. The exact dosage and frequency of injections are listed, and also some additional hormone therapy and occasionally geriatric measures. Symptomatic treatments are not reported. They do not constitute gerontotherapy.

In the nonmenopausal group of 58 patients, ages varied between 49 and 73 (average 60). One to 5 (average 3) injections a week were given, 5 to 30 (average 17) injections constituting a therapeutic course. Dosage varied from 0.1 to 1.0 (average 0.28) mg. estrogen and 5 to 25 (average 10.5) mg. androgen. Vaginal smears be-

fore the course varied from 0 to +++ (average +), and after the course from + to ++++ (average +++). One patient reported mammary soreness following larger doses of estrogen.

In the menopausal group of 30 patients ages varied between 43 and 58 (average 49). One to 6 (average 3) injections a week were given, 8 to 30 (average 18) injections constituting a therapeutic course. Dosage varied from 0.16 to 0.5 (average 0.31) mg. estrogen and 5 to 15 (average 10.7) mg. androgen. Vaginal smears before the course varied from + to +++ (average ++), and after the course from ++ to ++++ (average +++). There were 5 cases of hysterectomy 1 to 16 years previously.

Among the indications and symptoms, aside from the aging process, in order of frequency were fatigue, asthenia, hypotension, hypertension, anemia, depression, obesity, frigidity, migraine, and arthritis.

The estradiol benzoate used was mostly Schering's Progynon-B and only in a few cases Dimenformon (Roche). In a few instances an estrogen extract was used, and such was indicated by listing the dose in international units instead of milligrams. The progesterone used was Schering's Proluton.

Testosterone propionate was employed as Schering's Oreton. The 12.5 mg. dosage is due to the withdrawal of 0.5 cc. from an ampule of 25 mg. in 1 cc., or from a vial containing 25 mg. in 1 cc.

The anterior pituitary and cortical hormones were used in aqueous solutions mixed or singly according to indications. An unfractionated anterior pituitary preparation was employed whenever a pituitary deficiency seemed to exist. In a similar way the cortex extract was used, which, aside from individual indications, is frequently of great benefit to aging people (3).

Whenever cyclic treatment was used in menopausal cases, the gonadotropic hormone (APL) in the form of Schering's Pranturon was added to small doses of estrogen during the first part of the cycle. Larger doses of estrogen were given in mid-cycle and a combination of small doses of estrogen with testosterone or progesterone during the last week of the cycle. Progesterone replaced testosterone whenever sexual stimulation was to be prevented.

Vitamin B complex and thiamine chloride in small to medium doses (10 to 20 mg. in each injection) were added to the hormone combinations in the same syringe almost routinely with the idea that vitamin deficiency is a constant accompaniment to senescence. Besides, vitamin B complex, especially with liver extract, tends to regulate the normal metabolic functions of the liver (2), the organ which largely determines the pharmacologic response to the steroids. A constant thiamine chloride deficiency in old age was demonstrated by Mills (8) and also by Rafsky and Newman; the latter speak of biochemical avitaminoses (9) in normal aged individuals, the avitaminosis not being due to an inadequate diet. In this respect B Amino Complex Tablets were found to be a valuable dietary supplement.

Short wave treatments were applied to those glands that were suspected of being deficient to increase the blood supply in and around the glands and improve their function. This way stimulation and substitution treatment were combined.

Estimating the result of the treatment no separation was made into objective and subjective symptoms. Our increasing awareness of the psychophysical reaction, now referred to as psychosomatic medicine, makes such separation inadvisable. Even a gain in weight or a change in blood pressure may have psychic causes, therefore losing their objective character. Consequently it was decided to give only an impression of the therapeutic result. It must be left to other investigators either to compare their own impressions with those reported here or compare their results when using one hormone preparation alone with those obtained by using the combinations applied here. In

this series of cases combinations were superior in clinical effectiveness to single hormone administrations.

In appraising the therapeutic result as excellent, good, doubtful, or negative, decided conservatism was used. Likewise, the vaginal smears were under rather than overestimated. (A 2 per cent aqueous fuchsin was the staining solution). Their classification, B, before, and A, after, was from 0 (with many atrophy cells, etc.) to 4 plus (indicating complete cornification).

Among the nonmenopausal cases 14 (24.2 per cent) were found to have given an excellent response, 35 (60.4 per cent) a good, 8 (13.8 per cent) a doubtful, and only 1 (1.7 per cent) a negative result.

The 30 menopausal patients showed excellent response in 8 (26.7 per cent) cases, good in 18 (60 per cent), doubtful in 4 (13.3 per cent). None were entirely negative.

The most important clinical manifestations of therapeutic benefits are the following, listed in the order of their frequency:

Better sense of well-being
More physical strength, energy, and endurance
More initiative and mental endurance
Better emotional balance
Increased sexual response
Better sleep
Greater optimism
Relief of frequent headaches
Improved condition of skin, hair, and nails
Lowered average blood pressure in hypertension
Fewer and milder attacks of angina pectoris
Relief of urinary complaints

In addition, the menopausal patients who were treated cyclically when still menstruating reported the following.

Cessation of hot flushes and sudden attacks of perspiration
Less dysmenorrhea and premenstrual tension
Greater emotional stability
Relief of menopausal headaches

As far as the ratio between estrogen and androgen is concerned, it may not be possible to establish a universal optimum because nonmeasurable constitutional factors are undoubtedly operative. The ratio may have to be determined for each individual patient through clinical observation and a study of the vaginal smears or biopsies. Only a fairly large addition of androgen to estrogen seems capable of suppressing cornification.

In studies by Shorr, Papanicolaou, and Stimmel (11) 25 mg. testosterone propionate was needed to neutralize 0.5 mg. estradiol benzoate as far as the cornification of the vaginal epithelium was concerned. This was a ratio of 1 to 50 (1 mg. estrogen to 50 mg. androgen). Margolese (7) prevented bleeding by a ratio of 1 to 20.

The most frequent combination here employed which seemed clinically most satisfactory was 0.33 mg. estradiol benzoate with 12.5 mg. testosterone propionate injected two to three times weekly. This is a ratio of approximately 1 to 37. It did not prevent cornification, that is to say, the androgen did not neutralize the estrogen in this ratio but it did prevent bleeding. Naturally, no masculinization ever took place, not even with larger additions of testosterone.

Summary

Gerontotherapy indicates the treatment of the aging process as such.

Endocrinology offers, at present, the most promising clinical approach.

Endocrine gerontotherapy must rely principally on the steroid sex hormones.

A combination of estrogen and androgen injected simultaneously is clinically more effective in the female than the administration of single hormones.

In a total of 88 patients (58 nonmenopausal and 30 menopausal) the response in only one case was negative and in only 12 cases doubtful. The rest (75 cases, 85 per cent) were definitely benefited.

The combination here recommended is 0.33 mg. estradiol benzoate with 12 mg. testosterone propionate to 1 cc. usually given

FEMALE ENDOCRINE GERONTOTHERAPY WITH COMBINED STEROID SEX HORMONES

TABLE 1. NONMENOPAUSAL CASES

Case No.	Age	Indications and Symptoms aside from Aging Process	Total No. of Injections	Average No. Injections per Week	Average Dose of Estradiol Benzoate mg.	Average Dose of Testosterone Propionate mg.	Additional Hormone Therapy	Other Therapy	Impression of Result	Vaginal Smear Before and After Treatment	Remarks
1	64	Obesity Fibroma Uteri	12	3		12.5	Progesterone 5 mg.	Surgical Treatment Later	Excellent		
2	50	Asthenia Pancreatic Cyst?	12	2	0.1	12.5		B Complex with liver	Good	B++++ A+++	History of possible cervix lesion
3	55		25	3	0.33		Anterior Pituitary Solution		Good	B++ A++++	
4	57		12	3	0.33	6			Good	B 0 A+++	
5	59		12	3	0.33	6			Good	B 0 A+++	
6	60		10	3	0.33	12.5		B Complex	Good	B+ A++	
7	62		12	3	0.33	12.5		B Complex	Good	B 0 A++	
8	66		25	5	0.5	10	Aqueous Cortex Preparation	Short Wave	Good	B 0 A++++	
9	62	Angina Pectoris Arteriosclerosis	15	2	0.33	12.5		Thiamin	Good		
10	64		10	1	0.33	12.5			Good	B 0 A+	
11*	62	Obesity. Mild	25	4	0.16	12.5	Anterior Pituitary Thyroid	Short Wave Thiamin	Excellent		

10	64		10	1	0.33	12.5			Good	B 0 A+	
11*	62	Obesity. Mild Hypertension	25	4	0.16	12.5	Anterior Pituitary Thyroid	Short Wave Thiamin	Excellent		
12	63		25	4	0.33	12.5	Thyroid	Short Wave Thiamin	Excellent		
13	64		25	3	0.16	12.5	Thyroid	Short Wave Thiamin	Excellent		
14	60	Paroxysmal Tachycardia	11	2	0.16	12.5			Good	B 0 A++	
15	52	Asthenia	12	2	0.33	12.5			Good	B 0 A++	
16	65	Hypertension	11	5	0.2	12.5		B Complex	Excellent	B 0 A+++	
17	49		17	2	0.5	12.5		B Complex	Excellent		
18	50	Mild Anemia	8	3	0.33	12.5		B Complex with liver	Excellent	B 0 A++++	
19	70	Allergy Hypotension	25	3	0.33	15	Cortex	Calcium Vitamin C	Good	B 0 A+++	
20	58	Asthenia Neurosis	15	3	0.5	12.5		B Complex Thiamin	Doubtful		Abdominal Aneurism
21†	56	Hypotension	7	2	0.5	6			Good	B 0 A+++	
22	57		20	2	0.33	12.5		Occasional B Complex	Excellent	B++ A++++	
23	69	Hypertension	20	3	0.5	12.5		B Complex	Doubtful	B+ A+++	
24	65	Asthenia	18	4	0.16	12.5			Good	B+++ A++++	

* 11, 12, 13 same patient
† 21, 22 same patient.

FEMALE ENDOCRINE GERONTOTHERAPY WITH COMBINED STEROID SEX HORMONES—Continued

TABLE 1. NONMENOPAUSAL CASES—Continued

25	57		27	4	0.16	12.5	Anterior Pituitary Cortex	B Complex	Good	B+ A+++	
26	58		24	3	0.16	12.5		B Complex	Good		
27	67	Mild Osteo-arthritis	25	4	0.08	12.5		Short Wave A C Serum	Good	B+ A+++	Mammae Sore After Larger Doses of Estrogen
28	58	Anemia Hypotension	12	2	0.08	12.5		B Complex with liver	Good	B++ A+	
29	59		12	3	0.16	12.5		B Complex with liver	Good		
30	58	Fatigue Mild Anemia	25	2	0.33	12.5	Estrogen per os	Short Wave B Complex with liver	Good	B+++ A+++	
31	55	Failing Energy Incipient Cataract	12	3	0.33	12.5	Cortex. Anterior Pituitary	Thiamin Short Wave	Good	B 0 A+++	
32	56		12	3	0.33	12.5	Cortex. Anterior Pituitary	Thiamin Short Wave	Good	B+ A+++	
33	57		12	3	0.33	12.5	Cortex. Anterior Pituitary	B Complex Short Wave	Good	B+ A++	
34	49	Fatigue Underweight	20	3	0.25	12.5		Thiamin Short Wave	Excellent	B 0 A+++	
35	67	Failing Energy Mild Hypertension	24	3	0.33	12.5	Last 10 inj. Progesterone	B Complex Short Wave	Doubtful	B++ A++++	Sexual stimulat. after Test. Pr.
36	60	Fatigue Spinal Arthritis	20	2	0.16	12.5		B Complex Short Wave	Good	B++ A++++	
37	73	Osteo-arthritis Asthenia	25	4	0.5	12.5	Anterior Pituitary Cortex	B Complex	Good		
38	65	Fatigue Allergy	12	4	1.0	25.0		B Complex	Doubtful	B 0	
39	49	Fatigue	28	3	0.25	12.5		B Complex	Excellent	B++	

37	73	Osteo-arthritis Asthenia	25	4	0.5	12.5	Anterior Pituitary Cortex	B Complex	Good		
38	65	Fatigue Allergy	12	4	1.0	25.0		B Complex	Doubtful	B 0 A+++	
39	49	Fatigue Pseudo-angina	28	3	0.25	12.5		B Complex Short Wave	Excellent	B++ A++++	
40	60		25	4	0.33	15	Progesterone Anterior Pituitary. Cortex	Short Wave	Good	B 0 A+++	
41	67	Fatigue Spinal Arthritis	12	4	0.5	12.5	Anterior Pituitary	A C Serum Short Wave B Complex	Good		
42	57	Osteo-arthritis Allergy	20	3	0.33 and 5000 IU	12.5		A C Serum	Good	B 0 A+++	
43	58		15	3	0.25	12.5			Good	B++ A++	
44	69	Fatigue	12	4	0.33	5		B Complex	Good		
45	70		9	3	5000 IU	10			Doubtful		
46	71		5	3	0.5	12.5			Doubtful		
47	64	Low Vitality	15	4	0.16	12.5	Anterior Pituitary. Cortex	Thiamin Short Wave	Excellent	B 0 A++	
48	56	Hypothyroid	13	3	0.33	12.5	Anterior Pituitary. Cortex Thyroid	Thiamin	Good		
49	68	Hypotension Colitis	15	3	0.5	12.5	Cortex	Short Wave B Complex	Doubtful		
50	69		20	4	0.33	12.5		Short Wave Iron. Thiamin	Good		
51	70		30	5	0.16	12.5	Progesterone	Short Wave B Complex with liver	Good	B+ A++	
52	73	Cysto-rectocele Slight Arthritis	16	3	0.33	12.5		B Complex	Good	B 0 A++	

FEMALE ENDOCRINE GERONTOTHERAPY WITH COMBINED STEROID SEX HORMONES—Continued

TABLE 1. NONMENOPAUSAL CASES—Continued

53	53		25	3	0.16	12.5		Thiamin Short Wave	Excellent	B++ A++++	
54	54	Frigidity	12	3	0.08	20			Excellent	B+ A+	
55	55		30	5	0.1	12.5		Short Wave Thiamin	Excellent	B+ A++	
56	58	Mild Obesity Allergy	16	3	0.33	12.5	Anterior Pituitary. Cortex	Short Wave B Complex	Good	B++ A+++	
57	56	Neuritis Allergy	10	3	0.5	12.5		Ascorbic Acid	Doubtful	B+ A+++	
58	56	Depression	10	2	0.33	12.5		Short Wave B Complex	Negative	B++ A++++	

TABLE 2. MENOPAUSAL CASES

1	47	Asthenia Hypotension	25	2		12.5	Progesterone 5 mg.		Excellent	B+++ A++	Mastalgia
2	48		15	2	0.16 Alt Estrone 1500 I.U.	15	Hexestrol per os 3 mg./wk.		Excellent	B++ A+++	
3	45		20	3	0.5	12.5		B Complex	Excellent	B++ A++	Menses Irregular
4	46	Depression	30	2	0.16	12.5		Thiamin Short Wave	Doubtful	B++ A++	Menses Irregular
5	52	Allergy	9	3	0.33	12.5		B Complex	Good		No Menses
6	58	Paroxysmal Tachycardia	25	4	0.33	5		Thiamin	Excellent	B+ A+++	Hysterectomy at 42
7*	48	Hypertension	18	3	0.33			Thiamin	Good	B+++ A++++	No Menses
8	52	Hypertension	15	3	0.08	12.5	Occasional Progesterone		Good	B 0 A++	Cervical Erosion

* Cases 7 and 8 refer to the same patient.

7*	48	Hypertension	18	3	0.33			Thiamin	Good	B+++ A++++	No Menses
8	52	Hypertension	15	3	0.08	12.5	Occasional Progesterone		Good	B 0 A++	Cervical Erosion
9	43		10	1	Aqueous Estrone 0.5	Aqueous Testosterone 250 U			Good	B – A+++	Hysterectomy at 36
10	47	Hypotension Asthenia	9	3	0.5	6			Good	B+ A+++	No Menses
11	48		12	3	0.5	6		B Complex	Excellent		No Menses
12	46	Neurosis Frigidity	20	4	0.25	12.5		B Complex	Good	B++ A+++	No Menses
13	52	Hypotension Asthenia	30	3	0.5		Cortex	Thiamin	Good		Menopause by X-Ray at 35
14	49	To Preserve Ovarian Function	25	3	0.05		Cyclic APL and Progesterone		Good		Cyclic Combination Menses Regular
15	51	To Preserve Ovarian Function	20	2	0.15		Cyclic APL and Progesterone		Good		Cyclic Combination Menses Regular
16	51	Fatigue	25	5	0.33	12.5	Cortex. Anterior Pituitary	B Complex	Good	B++ A+++	No Menses
17	53		25	2	0.25 Alt 5000 I.U.	10	Progesterone at End of Cycle	Short Wave	Good		Menses Regular
18	51	Fatigue Slight Anemia	25	3	0.25	10	Cortex	B Complex with Liver	Good	B+++ A++++	Withdrawal Bleeding
19	43	Periodic Depression. Surgical Menopause	25	6	0.08	12.5	Anterior Pituitary. Cortex	B Complex	Doubtful	B 0 A+++	
20*	48	Low Vitality Neurosis	18	4	0.33			Thiamin Short Wave	Doubtful	B++ A++	Menses Irregular
21	49	Low Vitality Neurosis	12	5	0.5	6		B Complex	Good	B+ A++	Menses Irregular

* Cases 7 and 8 refer to the same patient.

* 20 and 21 same patient.

FEMALE ENDOCRINE GERONTOTHERAPY WITH COMBINED STEROID SEX HORMONES—Continued

TABLE 2. MENOPAUSAL CASES—Continued

22	56	Fatigue	12	3	0.33	12.5		A C Serum	Good		No Menses
23	55	Fatigue	8	3	0.5	6	Anterior Pituitary. Cortex	B Complex	Good		No Menses
24	57		10	3	0.25	12.5	Anterior Pituitary. Cortex	Thiamin	Good		No Menses
25	46		15	4	0.33	12.5	Progesterone APL		Excellent		Menses Irregular. Cyclic Combination
26	48	Anemia	14	3	0.16	6	Progesterone APL	B Complex with liver	Good		Menses Regular Cyclic Combination
27	47	Exhaustion	25	2	0.33	12.5	Progesterone Anterior Pituitary		Excellent	Usual +++ to ++++	Menses Regular Enlarged Uterus Cyclic Combination
28	50	Obesity	12	3	0.33	12.5		B Complex	Excellent	B+ A++	Hysterectomy 1 year ago
29	48	Migraine	15	3	0.16	12.5	Progesterone APL	B Complex	Good		Menses Regular Cyclic Combination
30	46	Obesity Hypertension	15	2	0.5	12.5	Thyroid	B Complex	Good	B+ A+++	Hysterectomy at 35

three times weekly. This represents a ratio of estrogen to androgen of 1 to 37.

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References

1. Benjamin, H.: New Concept of Gerontotherapy. *Urol. n Cutan. Rev., 48:* 17–24, 1944.
2. Biskind, G. R.. and Biskind, L. H.: Nutritional Deficiency in Etiology of Menorrhagia, Metrorrhagia, Cystic Mastitis and Premenstrual Tension; Further Observations on Treatment with Vitamin B Complex. *Surg., Gynec. & Obst., 78:* 49–57, 1944.
3. Goldzieher, M. A.: Endocrine Aspects of Senescence. *Geriatrics, 1:* 226–231, 1946.
4. Greenblatt, R. B.: Androgenic Therapy in Women. *J. Clin. Endocrinol., 2:* 665–666, 1942.
5. Korenchevsky, V.: War and Problem of Aging. *J.A.M.A., 119:* 624–630, 1942.
6. Loeb, L.: *Hormones and the Process of Aging.* Harvey Lecture, Series 36: 228–250, April 10, 1941.
7. Margolese, M. S.. The Control of Induced Estrogen Bleeding. *J. Clin. Endocrinol., 4:* 394–399, 1944.
8. Mills, C. A.: B Vitamin Requirements with Advancing Age. *Am. J. Physiol., 153:* 31–34, 1948.
9. Rafsky, H. A., and Newman, B.: A Quantitative Study of Diet in the Aged. *Geriatrics, 3:* 267–272, 1948.
10. Reifenstein, E. C., and Albright, F.: The Metabolic Effects of Steroid Hormones in Osteoporosis. *J. Clin. Investigation, 26:* 24–56, 1947.
11. Shorr, E., Papanicolaou, G. N., and Stimmel, B.: Neutralization of Ovarian Follicular Hormone in Women by Simultaneous Administration of Male Sex Hormone. *Proc. Soc. Exper. Biol. & Med., 38:* 759–762, 1938.
12. Walker, T. C.: Use of Testosterone Propionate and Estrogenic Substance in Treatment of Essential Hypertension, Angina Pectoris and Peripheral Vascular Disease. *J. Clin. Endocrinol., 2:* 560–568, 1942.

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Recoverable or Temporary Mental Disturbances in the Elderly

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THIS PAPER WAS PRESENTED AT THE ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. ON INVITATION OF THE PROGRAM COMMITTEE AS A PART OF A SYMPOSIUM ON THE PSYCHOLOGIC AND SOCIOLOGIC ASPECTS OF AGING. DR. MCGRAW POINTS OUT THAT A PROGRAM OF MENTAL HYGIENE WILL PREVENT MANY MENTAL DISTURBANCES IN THE AGED AND THAT MANY OF THE DISTURBANCES WHICH WERE FORMERLY REGARDED AS INCURABLE ARE IN REALITY ONLY TEMPORARY.

THE elderly group in the total population is rapidly becoming predominant because of the increased life span of the individual. From 1900 to 1940 the total population of the United States increased 73 per cent, while that portion of the population age 65 and over increased 192 per cent, or over two and one-half times the general rate (6).

Perhaps more emphasis has been on physiologic and socio-economic problems, but there is great need for research on all medical problems of gerontology, especially on the study of the rapidly increasing number of psychotic old people (6). Statistics for the 25 year period ending in 1936 for admissions to mental hospitals of patients suffering from senile psychoses and involutional melancholia show the startling increase of 181 per cent in the age group 70 and over (9).

In New York state in 1936 there were a total of 1905 first admissions of patients 70 years of age and over. In 1941 this had increased to 2,628 and in 1946 to 3,381. Stated another way, in 1936 the percentage of people 70 years and over admitted to state hospitals in New York state was 15 per cent of the total admissions, and in 1946 it was 26 per cent (1, 8).

Dayton (3) has indicated that mental disorder is a disease of old age. In support of this belief he presents figures on admissions to mental hospitals and data concerning the death rate of the general population in Massachusetts (1917-1933). Overholser accepts as "an illustration of the fact that as the physical organism loses its elasticity and shows an increasing tendency to undergo fracture, so does the personality lose its ability to adjust and manifests greater susceptibility to psychic strains" (9).

I am in complete agreement with the ideas expressed by Overholser (9) when he discusses the psychologic hazards of aging and suggests a suitable therapy for overcoming many of them. He is of the opinion that in the past too much emphasis has been put on the organic rather than the psychologic hazards of aging. Many patients show great mental changes thought to be due to advancing years, yet at autopsy only moderate pathologic changes of the brain are noticeable, and patients actually having marked cerebral lesions often have the ability to adjust and meet environmental demands.

The functioning of the personality as a

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Dr. McGraw is a fellow of the American Psychiatric Association, the Society for Psychotherapy and Psychopathology, the American Medical Association, and former president of the New York Society for Clinical Psychiatry.

whole is far more important than the functioning of the various organs or any of the organic changes attendant upon old age. The person who has always been able to meet changing demands in life without losing his sense of balance may even be able to withstand the damages of cerebral arteriosclerosis, while the neurotic personality, the hypochondriac, the rigid, the suspicious, and the hyperactive individual may as aging continues manifest symptoms necessitating institutional care.

As aging progresses, the total organism, mental as well as physical, gradually becomes more brittle. However, with an increased program of mental hygiene for the aging and the aged in preparation, many mental disorders in the aged may be prevented. In so doing, the psychically compensating factors in aging should be emphasized—the balanced judgment based on experience, the opportunity for reflection and study, the development of hobbies afforded by more leisure time, the comforts of a job well done. By first giving the patient the proper attitude concerning age, by treating him with patience, tact, and sympathy and avoiding over-invalidization, the physician, family, and friends can make the transition from late maturity to old age considerably easier (9).

Until such a program of mental hygiene can be widely instituted, much can be done at this time through the prompt recognition of and subsequent proper treatment of mental disorders in the elderly, many of which are recoverable. Formerly if a person over 70 developed mental disturbances manifested by abnormal behavior, disturbance of mood, abnormality of mental trends as shown by delusions or alterations in the perceptive attributes (such as questionable hallucinations) and in addition exhibited memory disturbances, the prognosis was considered rather hopeless; it was generally assumed that the patient suffered from senile psychosis or cerebral arteriosclerosis and that little could be done except to institutionalize him.

However, recent experience has shown that many mental disturbances of the elderly are transitory in character, are the results of emotional upsets, environmental stress, or toxic conditions, and that in a great many instances they may be favorably influenced or treated. It must be borne in mind that they still have the propensities which they always had, particularly the cyclothymic or manic-depressive. Simply stated, the elderly can have depressions and recover just as the younger group can.

The following cases are cited as examples of temporary or reversible disturbances. In each instance the person recovered sufficiently to resume normal living.

Brief Psychosis Caused by Trauma.—A few years ago I was asked to examine a man in his nineties because it was alleged that he was incompetent. Proceedings to have him declared legally incompetent and to have a committee of his person and property appointed were started after he had fallen from his bed and shown symptoms of rather marked confusion, disorientation, uncontrolled behavior, and incontinence. It was supposed that this condition would be progressive and that he could properly be considered incompetent, as he no doubt

was at the time when these proceedings were started.

He was examined by several qualified psychiatrists who sent in their report and the case was put on the calendar for trial before a jury. When I examined him some weeks after the other psychiatrists he was not disoriented nor confused, and his memory was fair. He knew accurately the extent of his property and he could exercise proper judgment in respect to it. He was also examined at this time by another psychiatrist whose findings agreed with mine.

The patient conducted himself well on the stand, and although somewhat garrulous and verbose, convinced the court that he was not incompetent. Actually he had had a slight concussion, followed by a period of confusion and disorientation and in spite of his great age had recovered.

Emotional Disturbance with Toxic Reaction and Contributory Factors Relating to Retirement.—The following case demonstrates the mingling of emotional, socio-environmental, and toxic features. The illness started in the summer of 1937 at the time of the patient's retirement. He was then 67 years of age, a native of northeastern United States, although he had been in England for 27 years as a works manager in a manufacturing concern. In this capacity he had shown initiative, tact, discrimination, and particular ability in the matter of handling management-employee relationships. He was of average mental endowment and his schooling had not been particularly extensive. His general health was good, although he had had rheumatic fever as a child and upper gastrointestinal disturbances and moderate hemorrhoids for several years. About 1930 he had shown some symptoms suggesting prostatic enlargement and had been under the care of a urologist. He had occasionally shown pus in his urine.

Early in July, 1937, several days before he was expected to attend a dinner in his honor on the occasion of his retirement, he had a bad night. Thereafter he appeared somewhat more restless, was argumentative, and complained of feeling dizzy and weak. On one occasion he said that he had had a vision—a religious experience. Never a very good public speaker, the speech which he made at the dinner was said to have been rather rambling. Ordinarily he probably would have made a very short speech.

Late in July rather suddenly he made up his mind to return with his daughter to America. On the morning of sailing he was found not to have his ticket although he said repeatedly that he did. He had not packed his baggage. On the boat he was separated from his traveling companions because of his failure to get a ticket until the last minute. He became increasingly confused and agitated, drank alcoholic beverages, which was not his custom, and sent numerous radiograms worked out in a special code. He misplaced some of his property, lost his landing ticket, argued with customs officials, and sent another cablegram. He explained that he was sending a cablegram in respect to a murder he thought had been committed on the boat and that he was the only one who knew about it. He became increasingly nervous and irritable, and had bad dreams from which he would awaken with a rapid pulse, sweating, and a high blood pressure. In New York the day after arrival he rode around in a taxi and did not have enough money to pay for it. He lost his way and was taken by the taxi driver to a police station and his relatives were notified.

He showed increasing over-activity but recognized his disturbance and was reasonably willing to enter a mental hospital where he remained for a total of three weeks. He was irritable, resistant, somewhat assaultive at first, and exceedingly active; his sleep was poor but he refused sedation. For a time he continued to maintain that he had seen a murder on the boat, had many ideas of reference, and believed that the actions and expressions on the faces of people had certain definite meanings.

Physical examination showed generalized arteriosclerosis, blood pressure of 195/110, an enlarged prostate, and some residual urine. His urine had a specific gravity of 1.008; there were fine granular casts, occasional pus cells. The blood N.P.N. was 45 mg. per cent on admission; nine days later the N.P.N was 35. The P.S.P. excretion was 15 per cent in the first hour; 20 per cent in the second hour, one week after admission. Nineteen days later the P.S.P. was 25 per cent in the first hour and 25 per cent in the second hour.

After his first three days of hospitalization he showed remarkable improvement, first in his behavior and mood. By the beginning of the second week he was entirely free of delusions and finally was able to look upon them with amusement. The blood pressure had dropped to 150/85 and he was discharged. The diagnosis was essential hypertension, generalized arteriosclerosis; hypertensive crisis with symptomatic psychosis of the delirious type.

This patient has recovered and has adjusted to his own satisfaction and to that of society. He had further difficulty with his prostate which necessitated a transurethral resection in 1939 and a further treatment in 1941. He has shown some mild cardiac deficiency, but with moderation in his physical activities he is not bothered by symptoms.

Effect of Environmental Stress in a Neurotic 70 year Old Woman.—Since marriage at the age of 31

this woman had been entirely dependent upon her husband and son. For six months she was completely bedridden, complaining of great pain in the lower back and refusing to use a bedpan because of the pain involved in lifting herself. She was querulous and dissatisfied with everyone and everything. Two medical men and a psychiatrist who examined her advocated a change of environment, which was effected with the aid of a wheel-chair, and a train trip to Florida. She improved gradually. Eight months later her husband suffered a cerebral hemorrhage and was hospitalized. She improved rapidly; for four months she lived in a nearby hotel, visiting her husband daily, traveling by trolley or taxi, although she had not traveled alone for the preceding fifteen years. Two and a half years after her husband's death she is managing her own home and has a companion-housekeeper whom she also manages.

Toxic delirious reactions in the elderly, of which the second case cited is an example, have recently received considerable attention. Robinson in 1945 reported on a series of such cases from the Neurological Hospital of Kansas City, Missouri (10). Of 22 patients who were treated there, 18 made an apparently complete recovery; 3 improved sufficiently to go home but did not return to former occupations, and 1 died. Robinson was impressed with the necessity of giving intravenous infusions of 10 per cent glucose in water, giving these very slowly. Other sources have stressed the importance of protein metabolism. The patient with delirious reactions whose history was presented in this paper received environmental treatment, prolonged sedative baths, attention to nourishment, and was rather promptly discharged when his condition warranted it.

Electric shock treatment in the elderly is sometimes quite useful, but it should be recognized that it is not a specific treatment. The danger of fracture of long bones of the vertebrae and of the acetabulum has to be borne in mind. Nevertheless, many hundreds of patients over 65 have successfully been given electric shock treatment without complications. It is advisable to give the elderly patients treatments less frequently than the younger: treatment for depressive reaction should be given once or twice weekly to the elderly, rather than on alternate days. In cases of excitement, younger patients require daily or more frequent treatments, whereas elderly patients usually need a total of perhaps two or three treatments on successive or alternate days. Recovery of memory from the individual treatment and from a series of treatments is slower in the elderly. Caution in respect to the total amount of treatments is also necessary. With proper nursing attendance, treatments can be given in the home or in an ambulatory setting as well as in a hospital environment.

That electric shock therapy is useful is attested to in articles which have been written by members of the staff of the Albany Medical College and the Albany Hospital (4), by members of the staff of the New York Hospital, Westchester Division (2), and by Gallinek (5), Lovell (7), and others.

Summary

Three cases of temporary mental disturbance in the elderly have been described to illustrate that not all mental disturbances in the elderly should be regarded as hopeless. In one the disturbance was caused by trauma, in the second the cause was toxic, complicated by emotional factors related to the patient's retirement, and in the third the cause was environmental stress.

References

1. Anon.: *Annual Report for Years 1936, 1941.* Department of Mental Hygiene, New York State.
2. Clow, H. E.: The Outlook for Patients Admitted to a Mental Hospital after the Age of Sixty. *New York State J. Med., 48:* 2357–2363, 1948.
3. Dayton, N. A.: *New Facts on Mental Disorders.* Charles C. Thomas Publisher, Springfield, Illinois, 1940.
4. Feldman, F., Susselman, S., Lipetz, B., and Barrera, E.: Electric Shock Therapy of Elderly Patients. *Arch. Neurol. & Psychiat., 56:* 158–170, 1946.

5. Gallinek, A.: Electric Convulsive Therapy in Geriatrics. *New York State J. Med., 47:* 1233–1241, 1947.
6. Johnson, N. A.: The Growing Problem of Old-Age Psychoses; An Analysis of the Trend in One State Hospital from 1910 to 1944. *Ment. Hyg., 30:* 431–450, 1946.
7. Lovell, H. W.: Electric Shock Therapy in the Aging. *Geriatrics, 3:* 285–293, 1948.
8. Malzberg, B.: Personal communication.
9. Overholser, W.: Mental Diseases in *Geriatric Medicine,* Edward J. Stieglitz, editor. W. B. Saunders Company, Philadelphia, 1943: pp. 263–278.
10. Robinson, G. W., Jr.: The Toxic Delirious Reactions of Old Age, in *Mental Disorders in Later Life,* Oscar J. Kaplan, editor. Stanford University Press, California, 1945, pp. 281–300.

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THE TRADITIONAL CHINESE ATTITUDE TOWARDS OLD AGE

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THIS PAPER WAS PRESENTED AT THE ANNUAL SCIENTIFIC MEETING OF THE GERONTOLOGICAL SOCIETY, INC. ON INVITATION OF THE PROGRAM COMMITTEE AS A PART OF A SYMPOSIUM ON THE PSYCHOLOGIC AND SOCIOLOGIC ASPECTS OF AGING. BECAUSE OF TRADITIONAL CONCEPTS DIFFERENT FROM THOSE OF WESTERN NATIONS, THE CHINESE TRADITION INCLUDES HIGH ESTEEM FOR OLD AGE. DR. CHANDLER RAISES THE QUESTION OF WHETHER OR NOT THERE IS REASON TO EXPECT THAT THE WESTERN WORLD MAY IN SOME DEGREE ADOPT THE CHINESE ATTITUDE TOWARD OLD AGE.

A BETTER perspective on problems of aging may be obtained if the attitudes towards old age in our culture and other cultures are compared. A comparison of the status of the aged in China and in the United States should be of special value because the fine quality of Chinese civilization and its extraordinary stability through more than two thousand years presents an example from which much can be learned. Three aspects of that civilization have a special bearing on the status of the aged—the family system, the conception of wisdom, and the conception of happiness.

Lin Yutang draws an idyllic picture of old age in China. According to him the Chinese *desire* to grow old, or at least to appear old, because of the privileges enjoyed by older people. When two people of different ages are together, the elder speaks freely and the younger must listen respectfully. Naturally the younger man wishes to grow older, so that he may talk more and listen less (7:195).

In family life, age brings authority. The important unit in China is not the individual or the nation but "the great stream of family life" (7:188). "Man himself passes through the stages of childhood, youth, maturity, and old age: first being taken care of by others, then taking care of others, and in old age again being taken care of by others; first obeying and respecting others, and later being obeyed and respected in return in proportion as he grows older" (7:189).

"According to the stream-of-life theory as seen in the family system, immortality is almost visible and touchable. Every grandfather seeing his grandchild going to school with a satchel feels that truly he is living over again in the life of the child, and when he touches the child's hand or pinches his cheeks, he knows it is flesh of his own flesh and blood of his own blood" (7:190).

"Such an arrangement of life in the family

Dr. Chandler received his B.A. degree from Dartmouth College in 1908 and his Ph.D. degree from Harvard in 1913; he also studied at Marburg and Goettingen. He was assistant in philosophy at Harvard from 1912 to 1913, instructor from 1913 to 1914, assistant professor of philosophy at Ohio State University from 1914 to 1925, professor since 1925, and visiting associate professor of philosophy, New York University, 1924–1925.

then is *satisfying* because a man's life in all its biological aspects is well taken care of" (7:191). The family not only takes care of the physical needs of the aged but gives them honor in their lifetime and a sense of being immortal in their descendants.

The virtue of filial piety binds each generation of the family to the preceding generations. In *The Book of Filial Duty*, Confucius is quoted as follows:

"A filial son has five duties to perform to his parents: (1) He must venerate them in daily life. (2) He must try to make them happy in every possible way, especially when the meal is served. (3) He must take extra care of them when they are sick. (4) He ought to show great sorrow for them when they are dead. (5) He must offer sacrifices to his deceased parents with the utmost solemnity. If he fulfils these duties, then he can be considered as having done what ought to be done by a son." (1:25).

"Our body and hair and skin are all derived from our parents, and therefore we have no right to injure any of them in the least. This is the first duty of a child.

"To live an upright life and to spread the great doctrines of humanity must win good reputation after death, and reflect great honor upon our parents. This is the last duty of a son.

"Hence the first duty of a son is to pay a careful attention to every want of his parents. The next is to serve the government loyally; the last is to establish a good name for himself." (1:16–17).

Filial duty does not require unconditional obedience. Confucius was asked whether it was filial "that a son should obey every command of his father, whether right or wrong?" In the course of his reply he said:

"If a man has a good friend to resist him in doing bad actions, he will have his reputation preserved; so if a father has a son to resist his wrong commands, he will be saved from committing serious faults . . . The maxim is 'Resist when wrongly commanded.' Hence how can he be called filial who obeys his father when he is commanded to do wrong?" (1:29).

A poem by the Emperor Wei of the third century A.D. translated by Arthur Waley illustrates the filial devotion of the younger generation to the older (8:60).*

ON THE DEATH OF HIS FATHER

I look up and see his curtains and bed;
I look down and examine his table and mat.
The things are there just as before
But the man they belonged to is not there.
His spirit suddenly has taken flight
And left me behind far away.
To whom shall I look, on whom rely?
My tears flow in an endless stream.
"Yu, yu" cry the wandering deer
As they carry fodder to their young in the wood.
Flap, flap fly the birds
As they carry their little ones back to the nest.
I alone am desolate
Dreading the days of our long parting:
My grieving heart's settled pain
No one else can understand.
There is a saying among people
"Sorrow makes us grow old."
Alas, alas for my white hairs!
All too early they have come!
Long wailing, long sighing
My thoughts are fixed on my sage parent.
They say the good live long:
Then why was *he* not spared?

Po Chü-i (772-846) expresses the intense love of children which gives comfort to the older generation and binds it to the younger. It is addressed to his late-born daughter and to his niece (8:232).*

CHILDREN

My niece, who is six years old, is called "Miss Tortoise";
My daughter is three—little "Summer Dress."
One is beginning to joke and talk;
The other can already recite poems and songs.
At morning they play clinging about my feet;

* Reprinted from *Translations from the Chinese* by Arthur Waley, by permission of Alfred A. Knopf, Inc., Copyright 1919, 1941, by Alfred A. Knopf, Inc.

At night they sleep pillowed against my dress.
Why, children, did you reach the world so late,
Coming to me just when my years are spent?
Young things draw our feelings to them;
Old people easily give their hearts.

Martin C. Yang gives a somewhat less idyllic picture of intrafamilial relationships but confirms the importance of the family unit and describes the care and respect given to the aged. He notes, however, that a farmer too old to work in the fields or go to market loses some of his authority (9:57). Olga Lang points out that modern influences have broken the traditional patterns in many Chinese families, and that tragedy often results from the conflict of old and new ideals (5, especially chapters III, X, and XVIII).

The idea of wisdom that prevails among the Chinese is a second influence on their feeling about old age. The background for this idea is to be found in their long history, in which there is so much stability and so little change as compared to European and American history. For more than two thousand years before the present century there was little change in Chinese agriculture, handicrafts, commerce, science, and education. In religion the only great change was the addition of Buddhism to the older cults of Confucianism and Taoism. By mutual assimilation their religions and philosophies blended together in endless recommendations of family loyalty, moderation, prudence, and tranquility. The Chinese had their troubles with changing dynasties, but they were old familiar troubles.

All this produces a conception of wisdom as insight into ordinary human relations and affairs. Lin Yutang quotes "the famous parable of the *Old Man at the Fort*" by "the great Taoist philosopher Liehtse" (7:160).

"An Old Man was living with his Son at an abandoned fort on the top of a hill, and one day he lost a horse. The neighbors came to express their sympathy for this misfortune, and the Old Man asked, 'How do you know this is bad luck?' A few days afterwards, his horse returned with a number of wild horses, and his neighbors came again to congratulate him on this stroke of fortune, and the Old Man replied, 'How do you know this is good luck?' With so many horses around, his Son began to take to riding, and one day he broke his leg. Again the neighbors came around to express their sympathy, and the Old Man replied, 'How do you know this is bad luck.' The next year, there was a war, and because the Old Man's Son was crippled, he did not have to go to the front."

Lin comments, "Evidently this kind of philosophy enables a man to stand a few hard knocks in life in the belief that there are no hard knocks without advantages . . . The possibility of calm, the distaste for mere action and bustle, and the running away from success and achievement are possible with this kind of philosophy, a philosophy which says: *Nothing matters to a man who says nothing matters*" (7:160).

This is the type of wisdom that the Chinese derive from long familiarity with their classic writings plus long experience with the ups and downs of every-day life.

In an unchanging society what a person learns in one decade is still applicable in a later decade. Therefore the person who has lived the most decades has the most wisdom. But in a shifting society the lessons learned in one decade may be utterly misleading in the next decade. In our society since the industrial revolution new forms of manufacture and transportation have been constantly coming up; the ability and willingness to learn new things is more helpful in this situation than memory of how things used to be done.

In the last two hundred years American settlements have spread from the Atlantic coast across the Alleghanies, across the prairies, across the Rockies to the Pacific coast. In generation after generation young men have gone forward to take up new land, to raise new crops, to open new mines, to meet new problems, and to face big risks with ingenuity and courage. The physical struggles and hardships of developing a new country have led us to glorify the restless

energy and the competitive spirit of youth. Being busy with the conquest of nature we have not developed the Chinese type of wisdom regarding human relations. Even in the older parts of our country where conditions have become more stable the glorification of youthful attitudes still persists. Thus youth is given the preference and the elderly are considered out of date.

In a changing society the young, who love change, adapt themselves quickly; the elderly, who have acquired fixed habits, are left behind in the race. They are less honored, less obeyed, they are more likely to be neglected. In an unchanging society length of life brings wisdom. The young see the advantage of honoring and obeying their parents; even the middle-aged can profit by the riper wisdom of the old and feel repaid for supporting them. Several Chinese proverbs illustrate this view (4: numbers 314, 315, 316):

"If you wish to succeed, consult three old people."

"He who will not accept an old man's advice will some day be a beggar."

"If a family has an old person in it, it possesses a jewel."

Thus the Chinese idea of wisdom brings honor to old people and makes age more desirable.

The idea of happiness that prevails among the Chinese is a third influence on their feeling about old age. The type of happiness they seek is more accessible to old people than the American type of happiness. Americans love the active use of their powers. They love change, speed, excitement, risk. Of course there are exceptions, especially among the elderly, who usually want peace and quiet. The Chinese tradition praises tranquility, moderation, simplicity. It is closer to the real doctrine of Epicurus than to other Western views. It encourages the cultivation of aesthetic appreciation. The Chinese have developed marvelous brush-work in lettering and painting, beautiful porcelains, and delicate carvings in jade and ivory. They are fond of gardening. They take pleasure in countless little things. No doubt there are exceptions —more especially among the young.

The Chinese notion of happiness is illustrated by the thirty-three happy moments of Chin Shengt'an, which Lin Yutang quotes. Chin, a seventeenth century critic, and a friend were once delayed in a temple for ten days by bad weather. To pass the time he and his friend made a list of the truly happy moments of life that they could recall. These were not great events in life but little incidents that had some delicate flavor. They were trifles, but trifles, can enrich life (7:131):

"It has been raining for a whole month and I lie in bed in the morning like one drunk or ill, refusing to get up. Suddenly I hear a chorus of birds announcing a clear day. Quickly I pull aside the curtain, push open the window and see the beautiful sun shining and glistening, and the forest looking as if it had just had a bath. Ah, is this not happiness?

"To cut with a sharp knife a bright green watermelon on a big scarlet plate of a summer afternoon. Ah, is this not happiness?

"A poor scholar comes to borrow money from me, but is shy about mentioning the topic, and so he allows the conversation to drift along on other topics. I see his uncomfortable situation, pull him aside to a place where we are alone, and ask him how much he needs. Then I go inside and give him the sum, and after having done this, I ask him: 'Must you go immediately to settle this matter or can you stay a while and have a drink with me?' Ah, is this not happiness?

"A traveller returns home after a long journey, and he sees the old city gate and hears the women and children on both banks of the river talking his own dialect. Ah, is this not happiness?

"To open the window and let a wasp out of the room. Ah, is this not happiness?"

All these moments are casual, unplanned, effortless, almost resultless. They depend on a childlike freshness of perception and feeling that the mature man has retained, or upon a delicate watchfulness and sensi-

tiveness which he has cultivated. The events may be accidental but the appreciation of them is a sign of wisdom and taste. Such trifles are not sufficient for happiness by themselves, for happiness must rest on basic adjustment to life. But trifles can add a lot to happiness if there is an awareness of them.

Happiness in old age, based on family relationships, is depicted in a poem by Wang Chi of the T'ang Dynasty (618-905 A.D.). Henry H. Hart translates it as follows (3:129):

SUCCESS

I ask you, my friend,
What ought a man to want
But to sit with his wine
In the sun?

My neighbors all come to talk over the news,
And to settle the problems of state.
I've no taxes to pay
On my house or my field.

I'm lucky, you say?
So I am!
My three sons?
Married, all of them:
Fine wives they've got,
And from the best families, too!

My daughters?
I've five of them, all wed.
Good husbands I found for them,
And every one rich!

So I sit in the sun
With my jug of old wine,
And I'd not change with the lords of the land!

The more aesthetic side of an old man's happiness is depicted in a poem by Li T'ai Po of the same dynasty (2:43).

THE HAPPY MOUNTAINEER

The old man dwells
In the eastern hills.
He loves the mountains
And the beauty of the pools.
In the green spring
He sleeps
In the lonely woods
And, even when the sun is high,
He lies abed
Inviting the pine-scented winds
To play
Through his loose garments.
The stone-strewn stream
Cleanses his heart
And purges his soul
Of the worries
Of this earth.

How I envy him
His escape
From the troubles
Of the world
And his repose
Upon his pillow,
High up
In the green-blue clouds.

The observations have been made that Chinese family life reserves its places of honor for the oldest generation; that the Chinese idea of wisdom is most fully achieved by old people, who thereby win increased honor; and that the Chinese idea of happiness is most fully achieved by old people, to whom tranquility comes more easily than to the young. Thus the Chinese attitude toward old age is due in large measure to social stability, the family system, and the resulting ideas of wisdom and happiness.

What are the chances that the people in the West may adopt the Chinese respect for age and their delight in it?

Western civilization seems to lack the factors that produced the Chinese attitude. Instead of stability there are revolutions in technology, economics, and politics. Family ties, never so strong as in China, are increasingly weakened by individualism and urban life, and ideas of wisdom and happiness are unlike those held by the Chinese. China itself in the last fifty years has felt the impact of western wars, western science, the industrial revolution, western education, and individualism, and there seems to be more likelihood of a decline in Chinese ideals of moderation, tranquility, and respect for age than an adoption of these ideals by Europeans and Americans (6:481-483).

Yet the Chinese ideals are congenial to

older people. As people grow older the pressure for large earnings should decline. The pressure of sex declines. The love of risk and excitement declines. When we speak of the mellowness of age we have in mind something approaching the Chinese outlook, an outlook that is not sluggish, apathetic, or empty, but one that involves full appreciation of relationships to family and friends. It involves trained sensitivity to the beauties of nature and art and to the charms of little incidents in life.

If such a viewpoint is congenial to older people, why should they not learn to live by it more nearly than they do? As older people are increasingly numerous in the population, why should they not adopt and defend some aspects of the Chinese viewpoint in such a way as to command public acceptance and respect?

It cannot be expected that in America older people will have the despotic authority they held in the old Chinese family, or that the quasi-religious virtue of filial piety will become a central feature of our mores. But if older people themselves display the virtues of poise and tranquility and tolerance, they may set a good example to our feverishly competitive society. If they demonstrate that life can be enriched by cultivating friendship and by making an art of enjoying simple things, they may exert a wholesome influence and receive increased respect.

Summary

In the Chinese tradition old age seems desirable. The family system with its ideal of filial piety gives authority, security, honor, and a sense of immortality to the older generation. The old are considered wise because of their long experience in a stable society. The conception of happiness in terms of tranquility, parental pride, and aesthetic appreciation favors the aged. Western civilization has lacked the social conditions that favored the aged in China, and these conditions are now being undermined in China itself. But as older people become more numerous and more influential in the western world they may seek to restore some aspects of the Chinese ideal.

This article is based on a broadcast given in the winter of 1947–1948 over station WOSU of Ohio State University in a series on Philosophy for Later Years.

References

1. Chen, Ivan: *The Book of Filial Duty*. John Murray, London, 1908.
2. Hart, Henry H.: *A Garden of Peonies*. Stanford University Press, Stanford University, California, 1938.
3. Hart, Henry H.: *The Hundred Names*. University of California Press, Berkeley, 1933 and 1938.
4. Hart, Henry H.: *Seven Hundred Chinese Proverbs*. Stanford University Press, Stanford University, California, 1937.
5. Lang, Olga: *Chinese Family and Society*. Yale University Press, New Haven, 1946.
6. Latourette, Kenneth Scott:. *The Chinese, Their History and Culture*. The Macmillan Company, New York, 1946.
7. Lin Yutang: *The Importance of Living*. Reynal and Hitchcock, New York, 1937.
8. Waley, Arthur: *Translations from the Chinese*. Alfred A. Knopf, New York, 1941.
9. Yang, Martin C.: *A Chinese Village*. Columbia University Press, New York, 1945.

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CONTEMPORARY OPINIONS

Grandmothers Are Guinea Pigs

HOPE GOULD ROBINSON

MRS. ROBINSON, THE FIRST CONTRIBUTOR TO THIS NEW SECTION OF THE JOURNAL OF GERONTOLOGY, PRESENTS THE STIMULATING IDEA THAT THE MODERN GRANDMOTHER HAS A NEW ROLE TO PLAY IN THE CHANGING DRAMA OF LIFE, FRESH AND UNSENTIMENTAL LINES TO SPEAK, AND AN UNLIMITED FIELD OF ACTION.

GRANDMOTHERS are guinea pigs. Gerontologists and geriatricians have put us into the laboratory and there is no humane society to protest. It looks as though we might as well try to cooperate.

So with breakfast dishes to wash, a disorderly house to condemn me for negligence, a stint of ironing glaring at me, and a telephone that keeps buzzing with abandon, I shall ignore the first two, stuff the third in a closet, and muffle the fourth. I shall take time out to reflect, not on the good old days, but on my status as a guinea pig. That is to say, the status of a grandmother in this fast moving drama called life.

Dr. Lawton in his challenging book *Aging successfully* says, "While young persons explore the mysteries of life, old ones should explain them because they have time to reflect more."

My daughter is in a hospital some fifteen hundred miles away, having just given birth to my fifth grandchild. Thousands of young women today are busy exploring the mysteries of biologic creativity. Like a recently married movie star, they can "hardly wait to have a baby." Many of these young mothers are blithely asserting that modern science proves "having babies can be fun."

I must reflect on the implications of that. Can having *grandchildren* be fun? I look at my gray hairs, feel the thready lines about the throat, rock an unsteady lower with my tongue, and attempt to appraise the contributions of science to the second half of life. Yes, she is kind and efficient too in her efforts to make old age tolerable, but . . . I must be honest, she is very remiss in ways to make it fun. The new sense of elderliness which a new grandchild gives a woman weighs against the pleasure it brings and it may constitute a major psychologic hazard. I must not be too hard on science. Hearing aids, dental restorations, gland treatments, and all the helps for the fading exterior must be appreciated. But I sigh, "These do little to sustain that spirit of eternal youth, that morale of maturity which is supposed to be part of us."

We who are fifty are facing a new kind of seniority. You and I, human guinea pigs, willing to be observed, examined, tested, experimented with, complimented to have the profession interested in us—even though we suspect our economic liability to be the stimulating cause—do question, (being human), what they intend to do with us.

Here is the third act of the quickly passing play of life on the world's stage. Science proposes to make the play longer, but does science say why or what for? We are the elders of three living generations approaching the status of revered ancestors. Will we be revered? Can lives be prolonged and

Mrs. Robinson, the mother of four children and the grandmother of five, has a wide field of interest—metaphysics, philosophy, psychology, sociology, and gerontology. She is on the contributors staff of the Science of Mind Magazine and has published articles on the psychologic aspects of Gerontology: How Old Is Old? (July, 1948), Why and What For? (January, 1949), and Education for Maturity (February, 1949). She is a member of the Gerontological Society.

if so should they be? If science gives more years can it guarantee more sense, without which the years would be intolerable? Can more years mean more fullness of experience or will there have to be more than years added to life?

Gerontology with its purpose expressed by "to add life to years, not just years to life," implies a wider field. Here is indicated that something about the play of life has changed, that persons in the second half of life may be stepping onto the stage in a new role. This role requires new lines. Who will write them? Will science provide the new script or will the actors have to ad lib for awhile? It is clear that grandpa and grandma are not supposed to say just what grandpa and grandma used to say. Even the unreflective bear witness to that. In the clothes they wear, the make-up they use, their ways of life—even in their protest that the grandchildren not use the old terms grandpa and grandma—the oldsters display a changed attitude. Just how "Nana" or "Gramps" can give an unsure woman or man a boost is not clear, but that we are pushed onto the stage in a new role is undeniable.

If our thinking about grandchildren has been limited to sentimental anticipation we are scarcely ready for our new part in the drama. If we have never considered what we might want to say, or be able to say, when these grandchildren appear we may be shocked speechless by the discovery we are launched on the same old round again. We thought we had finished when Jane and Bill got married, but with the first attack of colic mother is again in demand. The job has little new look about it. The diapers may be folded differently, the formulae may be easier to make, the washing machine, the sterilizer, and the gadgets may be more technically streamlined, but the smell of sour milk is unchanged and the wail of the new baby has an old, old ring which calls up memories of sleepless nights and long days of repetitive routine.

What kind of a response should a twentieth century grandmother, with science to aid her, make to the challenge of a new grandchild? It all depends. It depends on when she first thought about the possibility of being called in to help rear a second family. It depends on what she did when that momentous thought came to her. If as early as twenty-five or thirty it occurred to her that some day these kindergarten children around her would be presenting her with a second generation of babies, she may have been able then to think about that event in terms other than sentimental anticipation. In the thirties, busy with the ceaseless demands of a family of small children, she will be less likely to succumb to a nostalgia for repeating her experience as mother. She can then begin her emotional fortification for the future by finding moments in which to build her own integrity as a person. Time to do it may be meagre, but the desire to do it can be a growing, strengthening thing.

Whether we recognize it or not we are all creatures of conditioning. Dr. Lawton says, "In order to age successfully one must begin in childhood." Certainly a grandmother should be conditioned early and not wait for the frustration of middle-age to overtake her before she does anything about it. The first smile of a grandchild is a devastating moment and should be prepared for. The cute things he does can be fatal to a grandmother's own development. How can she go on to an expansive experience if she is

not emotionally conditioned so that she can meet the situation intelligently rather than sentimentally? Or how can she reflect on her place in a democratic society unless she is psychologically weaned from the "repeat pattern" of the family?

A woman who is able to question her relation to the family and to society the moment she becomes a grandmother may find the right lines to speak as she enters the stage for the third act. No lines have been written for her yet, but she may ad lib with considerable smoothness. The one who just supposed she would enjoy her grandchildren if they were near, or deplore the distance and the loneliness if they should be in another state or across the continent, is pledging her allegiance to the past. She will be sure to say the wrong words. She will be sitting in a modern day but speaking in an ancient way.

The twentieth century grandmother may be unenthusiastic about the job of baby sitting and say so. She may not go into ecstacies over the new grandchild. After all he has arrived when the world is in a grave state. It may not be lucky to be born in such times. A thoughtful woman knows that he may see more turmoil and experience more suffering than any generation before him. She may feel a blind groping desire to do something to help make the social environment better for this new generation. Discouraged by that outlook, she may feel an inner urge to know herself better, to find ways to live creatively. Her democratic heritage of freedom takes on new meaning. Or she may be so conscious of some new feeling of personal freedom—a release from cribs, toidy seats, and bottles—that her words border on a feminist declaration for a woman's bill of rights. Thus with mixed emotions and motives her lines as she steps into the third act will sound harsh, unfeeling, and certainly will be disappointing to those who were listening for the old familiar refrain, "Oh I have the most wonderful grandchild. Let me show you his picture."

In another case John and Jane may obviously be having a difficult time. John is finishing professional training that was interrupted by the war. Finances may be limited, home studies imperative, and with two or three babies Jane may find her energy running low. Then grandmother is in danger of feeling herself an indispensible person. But no one is likely to be helped much if she is too easily available as a baby sitter, and much damage may be done for grandchild, parents, and herself if it becomes habitual.

Upon reflection I suggest that the grandmother who seriously says to herself, "What *is* my role in this situation?" will find herself inspired to utter words that are so strange she will shock herself, her contemporaries, and at first disappoint those young mothers and fathers who were her responsibility only yesterday. Strange as they sound, even harsh lines are more suitable to the twentieth century than the old sentimental ones. Grandmother may refuse her traditional role because she feels there is some more important role which she could carry. She is indeed still a guinea pig in the laboratory, and her first ad libbing can only voice a refusal to drift through the years as an archaic fossil, the "Lot's wife" of an age already decadent.

Dr. Lawton writes further, "The dead are not always buried at once." Let every woman reflect on that, while science contrives to keep us above ground. Guinea pigs, acting in cooperation with modern technicians of gerontology, helped by the gift of new physical energy, may yet say with youthful enthusiasm, "Having creative ideas can be fun. Come on grandchildren, I am ready for you."

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CURRENT COMMENT

Institute on Problems of Aging

The Institute on Problems of Aging held at Washington University, St. Louis, April 11 and 12, evoked a great deal of interest and was well attended by 251 people. The following program was included in the five sessions:

SOCIOLOGICAL ASPECTS OF AGING, Robert J. Havighurst

PHYSICAL ASPECTS OF AGING, Edward J. Stieglitz

MENTAL ASPECTS OF AGING, Roy Hoskins

INSTITUTIONAL CARE OF THE AGED, E. M. Bluestone

ACTIVITIES OF GERONTOLOGISTS IN ENGLISH AND OTHER UNIVERSITIES, Vladimir Korenchevsky

PHYSIOLOGICAL DEMONSTRATIONS OF THE AGING PROCESSES, William B. Kountz and staff

TRENDS IN EMPLOYMENT, William H. Stead

AGING AND EMPLOYABILITY, Ewan Clague

RECREATION FOR THE OLDER PERSON, Oskar Schulze

COUNSELING THE OLDER PERSON, George D. Lawton

Many of these papers will be published in the October issue of the JOURNAL OF GERONTOLOGY.

Very Old at Record High in 1948

Those over 65 years reached a record high of 10,950,000 last year; those under 5 also attained the record high of 15,106,000. The median age was 29.8 years (men 29.4 years, women 30.2), the Census Bureau has reported. The over-all median age figure was the same in 1948 as in 1947, reflecting a temporary halt in the progressive tendency toward a heavier proportion of old people.

Television

People's Platform: How Can We Overcome the Fear of Old Age?, probably the first television program on the aged, was broadcast April 18. Preceding the discussion there was a short blended sequence of films, news clippings, and stills showing elderly people in the news and some animated graphic material illustrating the increase in the proportion of the aged to the general population.

The main feature of the film showed several persons picked from passersby on the street (a young, a middle-aged, and an elderly person) who asked questions about

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The hieroglyphics, "The Beginning of the Book for Transforming an Old Man into a Youth," at the top of this editorial page, are from the Edwin Smith Surgical Papyrus, translated by Professor John Breasted, University of Chicago Press.

their personal problems concerning old age. After each inquiry, Dr. George Lawton, Mr. Ewan Clague, with Mr. Quincy Howe as moderator, discussed extemporaneously the questions raised. Mr. Clague emphasized financial security for the elderly, Dr. Lawton stressed using the abilities of older people, and Mr. Howe thought that there was no fundamental disagreement between the two, but merely a difference in emphasis.

Education to Prepare for Old Age

Education to aid in adjustment to old age was the subject of a course offered in the spring of 1948 by the Extension Service and the Institute for Human Adjustment of the University of Michigan. Addressed to persons in middle age and later maturity the course was conducted experimentally in Ann Arbor for anyone who wished to attend. Forty-four persons ranging in age from 23 years to 84 years enrolled for the 15 lectures and discussion on biologic and psychologic aspects of aging, maintenance of physical and mental health, creative activities, problems of living arrangements and social security, and legal problems. The course and its outcomes are described in the *Adult Education Bulletin* for October, 1948.

During last fall and winter the demands for the course throughout the state exceeded the facilities for repeating it. The entire course or a modification was given, however, in five additional places. A full course of 12 lectures and demonstrations was held by the Extension Service in Detroit where 82 people enrolled. In Flint, the Extension Service and the Board of Education jointly offered a series of 10 lectures which were heard by 61 middle-aged and older people. The Traverse City Board of Education was able to find lecturers for a program of nine meetings attended by between 50 and 60 persons. In Bay City the Board of Education with the help of the YMCA and the YWCA offered a program of five lectures followed by exhibits and demonstrations of activities of older people. Attendance rose from 76 on the first evening to 91 by the third night.

A unique experiment was conducted in Windsor, Ontario, across the river from Detroit. The personnel manager and physician of the General Motors plant, who had attended the first experimental course in Ann Arbor, organized a series of 9 lecture-discussions for all plant employees 55 years of age or older and for their wives. After each meeting motion picture shorts on travel and other topics of human interest were shown. Attendance exceeded 50 persons at each meeting.

The lecturers in the courses are carefully selected experts who undertake to explain the aging process, identify the problems that arise, and offer suggestions for continued enjoyment of living. Requests for community facilities which will enable older people to increase the extent of their social participation and usefulness as citizens are increasing, and demand for the extension of courses to other communities is such that it will be difficult to meet all of them during the coming year.

To Add Life to Years

From time to time inquiries are received regarding the original source of the phrase "To add life to years, not just years to life" which appears on the cover of the JOURNAL OF GERONTOLOGY, but so far the origin has not been found.

The sentence, "It is for science not only to add years to life, but more important, to add life to the years." appeared in a paper, "The Aging Process: A Medical-Social Problem" by George Morris Piersol and Edward LeRoy Bortz which was published in the *Annals of Internal Medicine in* 1939.

Dr. Bortz writes, "I frequently heard my father make the following comment; it is not important to add years to life, it is more

important to add life to years. It is my impression that this statement was handed down from generation to generation."

Dr. Piersol adds the following comment: "Of one thing I am sure, neither Dr. Bortz nor I can justly claim that this remark originated with us. Along with other authors, we paraphrased it.

"I have a vague recollection that the original remark was made by Benjamin Franklin. It may be, however, that this is only another epigramatic remark attributed to that philosopher and wit."

The Editors will welcome further comments.

Elders in the News

Centenarians.—A spy for Lincoln during the Civil War, Henry Roe, a resident of Missouri, on his hundred and first birthday March 25 considered himself well started on his second century of living. He still works at his trade, bakes his own pastry, walks miles for exercise, and continues to meet life with a smile.

Mrs. Ellen Walker of Wakefield, England, not certain of her exact age, celebrated her one hundred and first birthday in 1947 and again in 1948. On checking proof was found that she was born May 8, 1849, so this year she marked her one hundred birthday. In England it is customary for the King and Queen to send a telegram of congratulation to those observing their hundredth birthday.

Mrs. Louis Hughes, Dow, Illinois, was 100 years old April 12. Until a year ago she lived alone and did her own housework.

Nonagenarians.—Gen. Jacob S. Coxey, who led "Coxey's Army" to Washington fifty-five years ago reached his ninety-fifth birthday April 16 "without an ache or pain."

At the age of 92, former national walking champion James H. Hocking took to the air. "It certainly beats walking," he commented after his first plane flight.

Octagenarians.—Grandma Moses, 88, frequently figured in the news in May as a recipient of the Women's National Press Club's 1949 achievement award in art.

Father of twins at 81, W. T. Thompson, Mississippi, and his wife, 41, have three other children, ages 2, 5, and 24.

The boss offered Mrs. Harriet Ballantine, Albany, New York, a half-day off to celebrate her eightieth birthday April 14, but she declined. "I'd rather stay and keep the other girls going," she explained.

Septagenarians.—Pierre Monteux, conductor of the San Francisco symphony orchestra, is 74 years old, but he intends to go on conducting until he is 109.

Bill "Bojangles" Robinson, 71 in May, is a perennially spry dancer. "I'm just startin' to get warmed up . . . All I ask now is about twenty more years in show business," he says.

Sexagenarians.—Alvin F. Bergman, Leetsdale, Pennsylvania, marked his sixty-second birthday May 14 by walking 62 miles from Atlantic City, New Jersey, to Philadelphia. The trip took twelve hours and twenty-five minutes. Bergman stopped only three times to refresh himself with coffee and orange juice.

News and Notes

The American Society for the Study of Arteriosclerosis has announced the following statement of policy: "The purpose of the American Society for the Study of Arteriosclerosis is to further research, to improve methods of diagnosis and treatment, to work toward prevention and to disseminate reliable information relative to arteriosclerosis.

"The membership is open to any scientist engaged in experimental or clinical research in the field of arteriosclerosis and related disorders. The Society seeks active cooperation with all organizations of similar aims or interested in related diseases and with any group which might be able to

help in the solution of the urgent problem of arteriosclerosis."

The following officers have been elected for the coming year: Dr. I. H. Page, President, Dr. E. C. Andrus, Vice-President, and Dr. O. J. Pollak, Secretary-Treasurer.

The annual meeting of the Society will be held November 5, 6, and 7, 1949, at the Hotel Knickerbocker, Chicago; Dr. C. E. Andrus, 24 East Eager St., Baltimore, Maryland, is Program Chairman. The annual meeting of the Gerontological Society will be held in conjunction with the meetings on November 5 and 6.

* * *

Smith, Kline & French Laboratories held a Medical Research Conference on the Clinical Problems of Advancing Years in Philadelphia March 16. The program included the subjects Television in Medical Education and Outlook for New Drug Therapy in Geriatrics, and panels on Cardiovascular Conditions and Overweight.

* * *

On March 17 the Academy of Medicine of Northern New Jersey devoted the evening of its annual meeting to an address on the problems of aging by Dr. Edward J. Stieglitz.

* * *

Northwestern University Reviewing Stand conducted a radio discussion in March on the question What Can We Do About Old Age?

* * *

The New York Academy of Medicine Eastern States Health Education Conference was held March 31 and April 1. The subject Social and Biological Challenge of the Aging Population was divided into The Biology of Aging, Population Demography, The Controllable Factors in the Aging Process, The Sociological Challenge, and The Maturation of the Individual and of His World.

The Club for Research on Ageing met in New York April 25 and 26.

* * *

On May 5 the County Medical Society of Philadelphia heard an address on the industrial health aspects of older workers.

* * *

The Chicago Nutrition Society's annual meeting May 11 featured the topic of nutrition of the aged.

* * *

The Ohio Citizen's Council held a meeting May 12 and 13 in Columbus on the problem of health in an aging population.

* * *

Dr. Robert W. Kleemeier, now Professor of Psychology at Northwestern University, has accepted the position as Director of the newly established laboratory for gerontology and geriatrics at Moosehaven, Florida, the city for the aged maintained and operated by the Loyal Order of Moose fraternity for the past 25 years. His appointment becomes effective September 15th.

The members of the National Advisory Council for Research at Moosehaven are: Dr. Anton J. Carlson, Professor Emeritus of Physiology, The University of Chicago, (physiology), Chairman; Dr. Ernst P. Boas, New York City (internal medicine); Dr. Ernest W. Burgess, Department of Sociology, The University of Chicago (sociology); Dr. George Lawton, New York City (gerontology); Dr. S. L. Pressey, Department of Psychology, Ohio State University (psychology of aging); Dr. Lowell S. Selling, Orlando, Florida (mental hygiene); Dr. N. W. Shock, U. S. Public Health Service (gerontology); Mr. Louis J. Haas, New York Hospital, Westchester Division (occupational therapy); and Dr. Martin L. Reymert, Director, The Mooseheart Laboratory for Child Research (psychology), who is charged with the supervision of all research activities of the Moose fraternity.

The Advisory Council recommends that the research objectives of the new laboratory

should be the investigation of the physical, nutritional, social, educational and emotional factors contributing to the improvement and maintenance of mental health in the aging population, as well as research in all processes of aging. According to Mr. Malcolm R. Giles, Executive Director of the Loyal Order of Moose, when the laboratory is well-established the fraternity would like to extend this laboratory's facilities to all national research bodies and individuals who would want to avail themselves of the rather unique opportunities for study in this model city for the aged.

GERONTOLOGIC reviews

DIABETES MELLITUS IN THE AGED

An analysis of statistical data regarding diabetes is complicated by many factors, certain facts, however, would seem to be valid.

The peak age of onset appears to be in the fifth and sixth decades. Joslin (Joslin, Root, White, Marble, and Bailey, The Treatment of Diabetes Mellitus, Lea and Febiger, Philadelphia, 1946) in a series of over 16,000 diabetic patients saw only 31 who developed the disease when over 80 years of age, 4 over 85, and 1 over 90.

Studies of the diabetic population in 1940 (Marks, New England Journal of Medicine, *235:* 298-294, 1946) indicate that the prevalence rates increase steadily with age to a maximum in the early seventies. Under 30 years of age less than 1 person per 1000 population was found to be diabetic, whereas in the early seventies approximately 1.5 per cent of the male and 2.5 per cent of the female population had diabetes. The incidence in extreme old age is not known because of too few observations in this age group.

Beyond the age of 45 the death rate as well as incidence for white women is approximately double that for men. The total death rate from diabetes during the past decade has increased only slightly. When compared to available data from 1920 to 1940, a definite lowering of the death rate among young persons was observed. This decline continued to the age of 45, whereas there was a marked increase in the rate beyond the age of 65. In agreement with this there has been, since the introduction of insulin, an increased longevity of diabetic patients, most marked in young patients and progressively less noticeable with increasing age.

It appears as if diabetes as it occurs in the juvenile, middle-aged, and aged varies in some respects and that several etiologic factors may be of importance. In the juvenile individual the disease is usually abrupt in onset, severer, more difficult to control, more frequently complicated by coma, acidosis, and hepatomegaly, rarely preceeded by obesity and degenerative changes, and the relationship of heredity is more clear-cut.

Himsworth and Kerr (Clinical Science, *4:* 119-158, 1939) in their studies of insulin/glucose tolerance, suggest that insulin-sensitive diabetic persons are deficient in insulin production and that this is characteristic of the juvenile diabetic patient whereas the insulin-resistant diabetic person reacts as if there were impairment of insulin action. It is their opinion that insulin-insensitivity is more common in the higher age group. It should be pointed out, however, that their data were obtained from only 13 patients, 18 to 64 years of age.

Newbaugh and Conn (Journal of the American Medical Association, *112:*7–11, 1939) have shown that certain of the obese middle-aged diabetic patients with glycosuria and relative insulin resistance upon a reduction of the obesity develop a nondiabetic type of glucose tolerance curve and that the disappearance of diabetic symptoms is related not to the degree of the obesity but to its duration. It is believed by many that this type of patient constitutes a substantial number of the middle-aged diabetic population.

Elderly diabetic patients are of two types, those whose disease started early but because of the use of insulin are now living to become old and those whose onset occurred at middle age or later. At present it appears that the two groups develop the same complications but that those whose disease is of many years duration develop complications at an earlier age. Joslin (The Treatment of Diabetes Mellitus, Lea and Febiger, Philadelphia, 1946; New England Journal of Medicine, *236:* 474, 1947), is of the opinion that with good control complications may be avoided, but until more data have been accumulated this point will not be settled.

It is of more than academic interest that the senile cataract and the diabetic cataract are very similar if not identical. O'Brien (Journal of the American Medical Association, *98:* 284–291, 1932) believes that hyperglycemia is very important in the development of senile cataract and in a series of 238 patients between the ages of 38 and 92 who required extraction of this type of cataract he found that over 50 per cent had either diabetes or an abnormally elevated blood sugar on glucose tolerance studies.

A high renal threshold for glucose in those past 70 years has been noted in a series of patients by Sylvest (Nordisk Medicin, *20:* 1703–1707, 1943).

Pathologic changes in the pancreas alone may account for some but not all of the instances of diabetes in old age. There is evidence to show (Warren, The Pathology of Diabetes Mellitus, Lea and Febiger, Philadelphia, 1938) that degenerative changes such as hyalinization and fibrosis of the islands of Langerhans are more frequent among aged diabetic persons and that hyalinization of the islands occurs at approximately the same time as similar changes usually seen in the smaller arteries throughout the body. Such changes are also seen in the aged nondiabetic person but with less frequency.

Arteriosclerosis is often discussed as an etiologic factor of diabetes. This is difficult to evaluate inasmuch as arteriosclerosis is also one of the complications of diabetes. As an etiologic factor it is usually dismissed with the statement that the peak onset of diabetes occurs before the peak onset of arteriosclerosis and that furthermore the onset of diabetes decreases early in the seventh decade whereas arteriosclerosis is progressive.

Sufficient data on the age of onset of arteriosclerosis, particularly in the older age group, are lacking, but although arteriosclerosis cannot be of major etiologic importance, instances are on record (Warren, The Pathology of Diabetes Mellitus, Lea and Febiger, Philadelphia, 1938) where extensive changes of the pancreatic arteries may have resulted in diabetes and thus be one of the etiologic factors. Isolated instances of diabetes have probably followed pancreatitis secondary to cholecystitis and other types of pancreatitis. Hydropic degeneration comparable to that seen in experimental diabetes is occasionally seen in the human and may be a result of excessive functional demands associated with hyperglycemia (Duff, American Journal of the Medical Sciences, *210:* 381–397, 1945).

Technical difficulties have prevented accurate estimation of quantitative changes of the island tissues; however, Warren has made some observations which suggest that there is a decrease in the number of islands

in postmortem examinations made on diabetic persons.

Experimental studies in rats indicate that young rats can withstand subtotal pancreatectomy better than older rats. Martinez (Journal of the American Medical Association, *133:* 196–197, 1947) has shown that pancreatectomy involving 95 per cent of the pancreas in 10 day old rats resulted in uncomplicated diabetes in a small percentage of the animals; in 60 to 70 day old rats diabetes developed in all animals followed by a 25 per cent mortality and in 547 day or older animals, acute diabetes developed in all animals followed by complications of infections, progressive weight loss, cataracts, and a 75 per cent mortality.

That a multiplicity of factors may produce diabetes is well established in the experimental animal and in some instances in man. Studies in progress throughout the world are employing such new techniques as determination of the insulin content of the pancreas, more accurate methods of quantitative estimation of the island tissue, and the selective destruction of the beta cells of the islands of Langerhans. Such papers as Duff's (American Journal of the Medical Sciences, *210:* 381–397, 1945), Haist's (Physiological Reviews, *24:* 409–444, 1944), and Joslin's (New England Journal of Medicine, (*238:* 401–407, 437–443, 471–476, 1948) furnish extensive reviews of these subjects.

The important fact of a decreased incidence of the onset of diabetes in the aged has not been satisfactorily explained. This, however, may be related not only to metabolic changes in the aged but also to such changes as limitation of activity, restriction of diet, and the avoidance of environmental and physiologic stresses. Further studies of these problems require more knowledge of the problems of nutrition, effect of repeated stresses, endocrine changes, and hereditary influences, as well as a continued study of the aging process.

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SWISS CONTRIBUTIONS TO GERONTOLOGY

The structure of the population of Switzerland is similar to that of the Anglo-Saxon countries, and this country is faced with similar social, medical, and economic problems caused by the increased number of aged people.

A large number of Swiss physicians and biologists have studied the problems of old age, although there no organization for gerontology exists.

A periodical entitled *De Senectute,* which is published in Zürich, is primarily devoted to the care of the aged and the economic problems which such care entails. There is also the "Schweizerische Stiftung für das Alter" (Swiss Foundation for Old Age), an organization which has considerable means at its disposal. Its local branches in every canton of Switzerland maintain a welfare service in addition to the compulsory Federal Old Age Pensions Scheme initiated in 1948. In most cities and other large communities there are Old Age Centers where regular social meetings for old people are held.

The problem of old age in its entirety has been studied by several medical writers. Roch (5) wrote an instructive essay with a broad outlook on the subject. A book by Vischer (8), which has been translated into various languages, discusses the problem of old age under its medical, sociologic, historical, and psychologic aspects. An interesting contribution towards the comprehension of senescence discussing the significance of optically active substances in aging

has been made by Kuhn (3), Professor of Physics in the University of Basel. Numerous papers on the aging of protoplasm have come from the laboratories of Ruzicka (6).

The study of arteriosclerosis is an important subject of gerontology. One of the fundamental contributions to this field was the study of the elasticity of the aorta in human beings between 20 and 60 years of age by Suter (7), Professor of Urology in Basel. Fleisch (1) made a graph showing the changes in the blood pressure in various ages.

The work of Vogt (9) on the heredity of signs of age in identical twins showed that in 34 pairs of between 55 and 81 years of age certain changes in the eyes, such as pinguicula, pterygium, and cataract are hereditary. Examination of senile cataract revealed the fact that it is not only hereditary as such, but also that a certain type of cataract is hereditary. Vogt's studies show that changes in the organism during old age are not so much dependent on conditions of environment as predetermined in the germinal plasma.

Important contributions to gerontology have been made by Swiss psychiatrists and psychologists. De Muningk (4), Professor of Philosophy in Fribourg, has drawn the outlines of the psychology of old age, and Wyrsch (10) has explored the problem of the significance of the various ages of man. Jung (2) has made a detailed study of the psychologic and spiritual problems of the aged. His purpose is to be of help to the individual who, arriving at the turning point of life when he realizes that old age is approaching, finds difficulty in adjusting himself to the new situation. He wishes to assist the aged individual in reaching an outlook in keeping with this new phase of his life.

In conclusion, there is a Swiss contribution to gerontology which is of a practical nature and which has done not a little to reduce the difficulties of the aged and at the same time help to overcome the latent conflict between the generations. In the Canton of Berne by the side of the big farmhouses there is a little cottage known as the Stock or Stöckli to which the old people retire with such possessions as they have reserved on making over their property to their heirs. The existence of such cottages has helped materially in solving the housing problems of the aged in Switzerland.

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REFERENCES

1. Fleisch, A.: Der normale Blutdruck. *Handbuch der norm. u. path. Physiol., 7:* 1267–1302, 1927.
2. Jung, C. G.: Ueber die Energetik der Seele. *Psychol. Abhandl., 2:* 102–137, 1928.
3. Kuhn, W.: Optische Aktivität und Begrenzheit der Lebensdauer. *Ztschr. f. Altersforsch., 1:* 325–341, 1938.
4. de Muningk, K.: Reflexions Philosophiques d'un Vieillard sur la Vieillesse. *Schweiz. med. Wchnschr., 16:* 433–437, 453–455, 1935.
5. Roch, Maurice: La Vieillesse. *Schweiz. med. Wchnschr., 16:* 340–360, 1935.
6. Ruzicka, V.: Über Protoplasmahysteresis und eine Methode zur direkten Bestimmung derselben. *Pflüger's Arch. f. d. ges. Physiol., 194:* 135–148, 1922.
7. Suter, E.: Ueber des Verhalten des Aortenumfanges unter physiologischen und pathologischen Bedingungen. *Arch. f. exper. Path. u. Pharmakol, 39:* 289–332, 1897.
8. Vischer, A. L.: *Old Age. Its Rewards and Its Compensations.* Allen and Unwin, London, 1947.
9. Vogt, A.: Altern, Abnützung und Hypovitaminose. *Schweiz. med. Wchnschr., 20:* 213–216, 1939.
10. Wyrsch, J.: Vom Sinn der Lebensalter. *Pro Senectute,* Zürich, 1932.

BOOKS

SYMPOSIUM ON SOCIAL PROBLEMS

PROCEEDINGS OF THE NATIONAL CONFERENCE OF SOCIAL WORK, 1948, Columbia University Press, New York, 1949, 498 pages (Section on the Aged 381–430) $6.00.

This volume, with its carefully selected and edited contents, is interesting both for what the contributors have to say in their respective fields and for the fairly accurate barometer of today's climate of thought which the papers constitute. In the section on Our Nation's Health, the contributions of Ginsburg and Schreiber on the social, economic, and political implications of mental health provide the basis for sober thought. The outlines of national and state planning for the chronically ill, of whom so many are older people, as stated by Terris of the American Public Health Association and Bourke of New York State point the way along sound lines for meeting the number one community problem, whether it be considered on the local, state, or national level.

The discussion in the section devoted primarily to the aged contains a series of presentations which are nicely balanced in that they approach the situation with which we are currently faced from that of income security, together with the attendant employment problems of older workers now aggravated by a loose labor market, the personal or mental health needs of an individual as determined by socio-economic position, and a description of living arrangements for older people both in this country and in Great Britain.

Burns, with her comprehensive knowledge of the security programs of this and other countries and of their objectives in terms of human satisfaction to be derived from them, develops very telling arguments for rational direction of the trend away from individual deficit budgeting for assistance toward pensions and contributory social insurance provisions.

Willard discusses the employment problems of older workers with a fine appreciation of both the individual's personal and economic needs. His analysis of the various cultural attitudes, the insurance factor as an element of cost to the employer, and the lack of knowledge of functional abilities of older workers, gives the reader a clear picture of the focal points in the employment situation calling for research in order to bring about changes and still be fair to both employees and employers.

The paper by Weinberg is indicative of a new willingness on the part of psychiatrists to see in the older person potentiality for profiting from psychiatric therapy. His appreciation of the inadequacies of older people and his ability to assist in discovering the causes for their responses to these inadequacies, together with his awareness of how little has been done to help social workers who are daily encountering the complex problems of older persons seeking their help, all hold promise for meeting

more effectively the mental health needs of older people in the future.

Hill discusses with sensitive understanding the personal requirements of the elderly in their living arrangements and takes into consideration the several economic and social factors which ultimately determine the kind of living arrangement an older person or couple really need. This paper is an inventory of a number of current experiments in group living, without any real effort to appraise their success. These experiments, she concludes, are evidence of our will to have our democratic way of life survive by responding to the stimulus of dissatisfaction with the old institutions of that democracy which are failing the elderly of today, both because of their numbers and because they themselves in their old age are different in a world which is so different from that of yesterday.

Clements outlines the changing concepts of responsibility for the elderly in Great Britain, indicating the historic importance of the National Assistance Bill of 1948 which opens with the significantly simple but drastic statement, "The existing Poor Law shall cease to have effect," which does away with the Elizabethan poor law from which much of our own social welfare legislation has stemmed. The new plan in Great Britain places the major responsibility for financial support of older people on the national government, thus leaving to local units and voluntary agencies that for the other social services and the more individual relationships which must be maintained.

The volume of proceedings as a whole lives up to its traditional standard as a source book which anyone who is interested in social trends should have at hand for ready reference.

OLLIE A. RANDALL

HEALTH FOR OLDER PEOPLE

THE YEARS AFTER FIFTY, Wingate M. Johnson, Whittlesey House, New York, 1947, 153 pages, $2.50.

This addition to the Whittlesey House Health Series aims to help those "who have passed the half-century mark to live more calmly, happily, fruitfully and philosophically during the rest of their lives." Based on the author's personal efforts to this end as well as on his many years as a medical practitioner, it strikes a note of sane optimism which should be helpful to the layman beset by folklore and outworn beliefs about old age.

The good sound common sense of the wise physician makes this book stand out among the many others which have attempted the same goal. Particularly recommended for their clarity are the chapters on Dietary Fads and Fancies, Exercise and Recreation, and Preparing for Old Age. Throughout the work the author has tried to eliminate theoretic or technical discussion, and avoids at all times giving needless alarm. On the other hand he presents the whole picture realistically and in accordance with the sound viewpoints that his own life and learning have given him. This volume may be placed in the hands of patients with confidence.

FREDERIC D. ZEMAN

RELIGIOUS ASPECTS

OLDER PEOPLE AND THE CHURCH, Paul B. Maves and J. Lennart Cedarleaf, Abingdon-Cokesbury Press, New York, 1949, $2.50.

This book deals with the applications of the growing knowledge of gerontology to church programs and pastoral service and is divided into four parts. Part I, Aging

and the Church, deals largely with the findings of gerontology, including a discussion of those population trends which reflect an increase in the number of people in the later years, the aging process with emphasis on the adjustments and compensations of later maturity, and bases of personality development and conflict among elderly persons. In this section the authors give evidence of a thorough acquaintance with the developing science of gerontology. There is nothing slipshod in their interpretation.

Part II deals with the Pastoral Care of Older People. In this section the authors attempt to apply principles of case work interviewing to the pastoral visit. The diagnostic and the therapeutic aspects of interviewing are both discussed and illustrated. While the reviewer finds no disagreement with this presentation he questions whether the 50 pages devoted to interviewing principles will prove an effective educational device for ministers and lay leaders in the Church. In contrast, a program of pastoral care which concludes this section offers several useful suggestions to both pastors and lay visitors in their work with elderly persons.

Group Work with Older People, treated in Part III, gives an excellent discussion of the functions of group leadership. Standard principles of good group work practice are applied generally to the church program and in particular to the activities which include older members. For most readers this section will prove the most thought provoking and useful of the entire book, regardless of the age group in which one participates or serves as a leader.

Part IV concludes the book with a discussion of Social Resources and the Church. In this section the authors treat the problems of social security and retirement and give special attention to the social and welfare services that are available or that may be developed for those in the later years. Distinctions are drawn between those capable of self-care and those requiring supervisory or custodial care. Medical and nursing resources, old people's homes, and emerging social services of the Church for the aged receive attention. This section does just what the title implies—it informs the reader of the resources, public and private, which may be drawn upon in meeting the multiple needs of elderly persons.

While Maves and Cedarleaf have pointed their discussion toward a church program there is much in their book that will be stimulating to those whose concern for the aged is divorced from religious implications or associations. Their scholarly presentation does not rule out occasional pungent statements which add to reading interest, such as, "We want no ghetto of later maturity." Naturally there are occasional observations which the reviewer would challenge. One is the comment that "secondary groups are more temporary" (than primary groups). Certain secondary groups may be more temporary than the family or boys' gang. On the other hand other secondary groups such as race, nation, and religious body are far more permanent. This taking issue with a few observations should in no way raise question to the genuine merits of *Older People and the Church.*

ELON H. MOORE

LECTURES TO THE LAITY

PERSPECTIVES IN MEDICINE—THE MARCH OF MEDICINE 1948, Number XIII of the New York Academy of Medicine Lectures to the Laity, Columbia University Press, New York 1949, 163 pages, $2.50.

Among the numerous educational activities of the New York Academy of Medicine, the annual Lectures to the Laity have for fourteen years maintained a high professional standard and gained wide influence among listeners and readers alike.

The present volume contains addresses on The Atom in Civil Life by Lewis L. Strauss, member of the United States Atomic Energy Commission; on Food and Civilization by Sir Raphael Cilento, Director, Social Division, United Nations; on Being Old too Young by Dr. Edward J. Stieglitz, noted expert on geriatrics; on Perspectives in Cancer Research by Dr. Cornelius P. Rhoads, Director of the Memorial Hospital, New York; on Psychiatry for Everyday Needs by Dr. William C. Menninger of the Menninger Foundation, Topeka, Kansas; on The Interrelation of Pure and Applied Science in the Field of Medicine by Dr. James B. Conant, President of Harvard University. The reputation of each of the speakers is such that this listing of the titles should be enough to engage the serious attention of physicians as well as of the laity.

Under an extremely clever title Dr. Stieglitz discusses the social problems of gerontology, the biology of senescence, geriatric medicine, and the diseases of senescence, emphasizing the need for education, research, and periodic health examinations, in the hope of attaining longevity with health. While there is little new in this paper for readers of this journal, it is a model of popular exposition and may well be studied by those who have occasion to give similar discourses to nonprofessional audiences.

Dr. Menninger's presentation of psychiatry for everyday needs discusses the handicaps confronting psychiatry, basic psychiatric knowledge, psychiatric applications in childhood, the needs of the average adult, and the needs of society. He closes with a serious warning. "Democracy is founded on a belief in the power and dignity of the individual. If our way of life is to survive, it will be because we as individuals have made a study of ourselves. After a good look at ourselves we must do something to get the kinks out of our relationships with other people that have become fouled up by our hatreds, jealousies, envies, selfishness, isolationism, and immaturity."

FREDERIC D. ZEMAN

BOOKS RECEIVED

Books received since April 1, 1949, are acknowledged in the following list. Insofar as space and time permit, some will be selected for review in a later issue, but it is unlikely that all will be reviewed.

Geriatric Medicine. The Care of the Aging and the Aged., second edition, edited by Edward J. Stieglitz, W. B. Saunders Company, Philadelphia, 1949, 733 pages, $12.00.

How to Retire and Enjoy It, by Ray Giles, Whittlesley House, New York, 1949, 286 pages, $3.00.

Making the Most of Maturity, Life Conservation Service of the John Hancock Mutual Life Insurance Company, Boston, 1946, 32 pages (pamphlet).

Mentally Ill in America, by Albert Deutsch, Columbia University Press, Morningside Heights, New York, 1949, 555 pages, $5.50.

Obesity, by Edward H. Rynearson and Clifford F. Gastineau, Charles C. Thomas, Publisher, Springfield, Illinois, 1949, 134 pages, $3.50.

Older People and the Church, by Paul B. Maves and J. Lennart Cedarleaf, Abingdon-Cokesbury Press, Nashville, 1949, 272 pages, $2.50 (reviewed in this issue, page 258).

Perspectives in Medicine—The March of Medicine 1948, Number XIII of the New York Academy of Medicine Lectures to the Laity, Columbia University Press, New York, 1949, 163 pages, $2.50 (reviewed in this issue, page 259).

We Are Growing Older, Committee on the Care of the Aged, Commission on Christian Social Relations, Diocese of New York, 1949, 23 pages (pamphlet).

Years After Fifty, by Wingate M. Johnson, Whittlesey House, New York, 1947, 153 pages, $2.50 (reviewed in this issue, page 258).

INDEX TO CURRENT PERIODICAL LITERATURE

It is difficult to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or send reprints.—Editor.

ABRAM, LEWIS E.—(See Cohen, Milton B.)

ACKERMANN, P.—L. Hofstatter and W. B. Kountz. Concentration of Free Valine, Tryptophane, and Histidine of Plasma of Young and Old Individuals, Determined with the Microbiologic Method. *Journal of Laboratory and Clinical Medicine, 34:* 234–238, 1949.

AGED, CARE OF—Care of the Aged in England, from Medieval Times to the End of the 16th Century. Sona Rosa Burstein. *Bulletin of the History of Medicine, 22:* 738–746, 1948.

Experiment in Caring for the Aged Sick. Norman Shigon and Myrtle C. Stanon. *Southern Hospitals, 17:* 23–24, 1949.

Medical Care—A Community Plan. E. M. Bluestone. *Survey, 85:* 3 pages, Mar., 1949.

Medical Social Work for the Aged. Anon. *Bulletin of the American Association of Medical Workers, 22:* 4–10, 1949.

Public Health Care of the Healthy Aged. F. A. Belam. *Medical Officer, 81:* 83, 1949.

Treating the Aged Sick at Home. Lord Amulree. *British Medical Journal, no. 4603:* 545, 1949.

ALCOHOLISM—Alcohol; Geriatrics. K. M. Bowman. *American Journal of Psychiatry, 105:* 521–524, 1949.

ALLEN, EDWARD B. — Psychological Orientation in Geriatrics. *Geriatrics, 4:* 67–73, 1949.

ALLERGY—A Statistical Study of the Emotional Component in Allergy: Its Relationship to the Age and Sex Distribution of 5,583 Patients. Milton B. Cohen and Lewis E. Abram. *Journal of Allergy, 20:* 207–210, 1949.

ALPERN, M.—(See Hitsch, M. J.)

AMULREE, LORD—Treating the Aged Sick at Home. *British Medical Journal, no. 4603:* 545, 1949.

ANONYMOUS—The Case Against Higher Old-Age Pensions. *National Insurance Gazette, 37:* 616–617, 1948.

Ceilings Increased on Aid for the Aged and Blind. *Public Aid in Illinois, 16:* 1, 1949.

Cryptogram of Age. *Lancet, 256:* 657, 1949.

Does Death Follow Retirement? *Management Record, 11:* 121–123, 1949.

Elderly Primagravida. *Lancet, 256:* 696–697, 1949.

Is There a Key to Long Life? *Science Digest, 25:* 74–75, 1949.

Making Aged Healthy Seen as Way to Lasting Peace. *Science News Letter, 55:* 205, 1949.

Medical Social Work for the Aged. *Bulletin of the American Association of Medical Workers, 22:* 4–10, 1949.

Model Institution Designed to Provide Homes for Aged People. *Canadian Hospital, 26:* 35, 1949.

Pantothenic Acid and Longevity. *Nutrition Reviews, 7:* 37–38, 1949.

Ripe Old Age. *Science Illustrated, 3:* 112, 1948.

Study of Nutrition in Relation to Aging. *California Health, 6:* 49, Oct., 1948.

Special "Needs of the Aged" Issue. *Louisiana Welfare, 8:* Oct., 1948.

West May Need Chinese Attitude Toward Old Age. *Science News Letter, 55:* 57, 1949. Same abbreviated, *Science Digest, 25:* 38, April, 1949.

What Next in Company Pension Plans? (A summary of addresses delivered before a round table conference on this subject at the 300th meeting of the National Industrial Conference board at the Waldorf-Astoria hotel on Tuesday, Nov. 23, 1948.) *Management Record, 11:* 4–6, 36–42, 1949.

What Price Old Age? *Technocrat, 17:* 7, April, 1949.

Working Toward Vocational Oblivion (Editorial). *Digest of Neurology and Psychiatry, 17:* 123–125, 1949.

ANTIRETICULAR CYTOTOXIC SERUM—Notes Pratiques sur le Serum de Bogomoletz; Serum Antireticulocytotoxique. H. Conze and V. Iline. *France médicale, 12:* 9–12, 1949.

Suero de Bogomolets; Indicaciones, Contraindicaciones y Pruebas Previas al Uso del Suero Anti-Reticular Citotoxico en Padecimientos de Orden Quirurgico. C. Colin. *Revista mexicana de ciencia medical, 7:* 1–10, 1949.

APPELMAN, DAVID H.—Morris S. Feiman and Louis Harris. Acute Rheumatic Fever in the Aged. *American Heart Journal, 37:* 982–985, 1949.

ARTERIOSCLEROSIS — Radiological Studies of the Abdominal Aorta in Individuals over 50 as an Aid to the Differential Diagnosis between Benign and Malignant Ulceration of the Stomach. A. Elkeles. *British Journal of Radiology, 22:* 280–283, 1949.

BELAM, F. A.—Public Health Care of the Healthy Aged. *Medical Officer, 81:* 83, 1949.

BERLIN, LOUIS — Presenile Sclerosis (Alzheimer's Disease) with Features Resembling Pick's Disease. *Archives of Neurology & Psychiatry, 61:* 369–384, 1949.

BIDDER, H. VON—and E. Undritz. Der Einfluss von Alter und Geschlecht auf Hemoglobin, Erythrocyten und den Eisengehalt der Leber bei der normal ernährten weissen Laboratoriumsratte. *Helvetica physiologica et pharmacologica acta, 6:* 765–772, 1948.

BIOCHEMISTRY—An Electrophoretic Analysis of the Plasma Proteins in the Aged. H. A. Rafsky, B. Newman, and C. I. Krieger. *American Journal of the Medical Sciences, 217:* 206–210, 1949.

Das Leber und Milzeisen bei mann und Frau in verschiedenen Lebensaltern. E. Schairer and J. Rechenberger. *Virchows Archiv für pathologische Anatomie und Physiologie und für klinische Medizin, 315:* 309–319, 1949.

BLAIR, W. F. —Population Density, Life Span, and Mortality Rates of Small Mammals in the Blue-Grass Meadow and Blue-Grass Field Associations of Southern Michigan. *American Midland Naturalist, 40:* 395–419, 1948.

BLOOD—Blood Volume Studies in Middle-Aged and Elderly Males. Jerome E. Cohn and Nathan W. Shock. *American Journal of the Medical Sciences, 217:* 388–391, 1949.

Der Einfluss von Alter und Geschlecht auf Hemoglobin, Erythrocyten und den Eisengehalt der Leber bei der normal ernährten weissen Laboratoriumsratte. H. von Bidder and E. Undritz. *Helvetica physiologica et pharmalogica acta, 6:* 765–772, 1948.

Sänkningsreaktionen hos åldringar (Sedimentation Rate in Normal Aged Persons). S. Eckerström. *Nordisk Medicin, 41:* 471–472, 1949.

BLUESTONE, E. M.—Medical Care—A Community Plan. *Survey, 85:* 3 pages, Mar., 1949.

BONE—Normal Flexibility According to Age Groups. H. O. Kendall and R. P. Kendall. *Journal of Bone Surgery, 30A:* 690–694, 1948.

Relation to Age and Function of Regional Variations in Nitrogen and Ash Con-

tent of Bovinė Bone. Louis J. Strobino and Lee E. Farr. *Journal of Biological Chemistry, 178:* 599–609, 1949.

BOWMAN, K. M.—Alcohol; Geriatrics. *American Journal of Psychiatry, 105:* 521–524, 1949.

BRIDGERS, W. H.—and R. B. Stith. Modern Management of Certain Chronic Diseases of Middle Life. *Journal of the South Carolina Medical Association, 44:* 381–390, 1948.

BROWN, A. M.—Surgical Correction of Senescent Pendulous Cheeks. *Journal of the International College of Surgeons, 12:* 154–160, 1949.

BRUSKEWITZ, HAROLD W.—(See Ewell, George H.)

BRYANT, A.—How Best to Grow Old. *Illustrated London News, 213:* 450, Oct., 1948.

BURSTEIN, SONA ROSA—Care of the Aged in England, from Medieval Times to the End of the 16th Century. *Bulletin of the History of Medicine, 22:* 738–746, 1948.

BUSK, T.—(See Clemmesen, J.)

CAMPBELL, H. L.—(See Sherman, H. C.)

CANCER — Age Distribution Figures for Malignant Diseases in Denmark, 1942–1944. J. Clemmesen, T. Busk, and A. Nielsen. *Acta radiologica, 31:* 51–59, 1949.

Aging Processes in the Ovaries of Mice Belonging to Strains Differing in the Incidence of Mammary Carcinoma. Leo Loeb. *Archives of Pathology, 46:* 401–440, 1948.

Mammary Cancer in Castrate Male Mice Receiving Ovarian and Hypophyseal Grafts at Various Ages. R. Silberberg and M. Silberberg. *Proceedings of the Society for Experimental Biology and Medicine, 70:* 510–513, 1949.

Should the Elderly Cancer Patient Be Told? Raphael Ginzberg. *Geriatrics, 4:* 101–107, 1949.

CAPLES, W. G.—Pension Plans as a Subject of Collective Bargaining. *Personnel Management Record, 11:* 4–6, 36–42, 1949.

CARDIOVASCULAR—Die Behandlung peripherer Durchblutungsstörungen mit besonderer Berücksichtigung der alten Erfrierungen. F. Judmaier. *Wiener Klinische Wochenschrift, 61:* 85–90, 1949.

Cardiovascular System in Old Age. T. H. Howell, *Medical World, 69:* 679–681, 1949.

Ueber altersbedingte Aenderungen des peripheren Venendruckes bei gesunden Menschen. F. Odenthal. *Deutsche medizinische Wochenschrift, 74:* 112–114, 1949.

CAVAN, R. S.—Family Life and Family Substitutes in Old Age. *American Sociological Review, 14:* 17–83, 1949.

CHODOFF, P. — Pneumoencephalographic Diagnosis of the Presenile Dementias. *Archives of Neurology and Psychiatry, 59:* 823–826, 1948.

CHRONIC ILLNESS—Care of the Chronically Ill. J. I. Goodman. *Ohio State Medical Journal, 44:* 1205–1209, 1948.

Chronic Illness and Socio-Economic Status. P. S. Lawrence. *Public Health Reports, 63:* 1507–1521, 1948.

Modern Management of Certain Chronic Diseases of Middle Life. W. H. Bridgers and R. B. Stith. *Journal of the South Carolina Medical Association, 44:* 381–390, 1948.

Planning for the Chronically Ill; a Cooperative Task. J. H. Kinnaman. *New York State Journal of Medicine, 49:* 527–530, 1949.

CLAPPER, M. M.—(See Dodge, H. J.)

CLEMMESEN, J.—T. Busk and A. Nielsen. Age Distribution Figures for Malignant Diseases in Denmark, 1942–1944. *Acta radiological, 31:* 51–59, 1949.

COHEN, MILTON B.—and Lewis E. Abram. A Statistical Study of the Emotional Component in Allergy: Its Relationship to the Age and Sex Distribution

of 5,583 Patients. *Journal of Allergy, 20:* 207–210, 1949.

COHN, JEROME E.—and Nathan W. Shock. Blood Volume Studies in Middle-Aged and Elderly Males. *American Journal of the Medical Sciences, 217:* 388–391, 1949.

COLIN, C.—Suero de Bogomolets; Indicaciones, Contraindicaciones y Pruebas Previas al Uso del Suero Anti-Reticular Citotoxico en Padecimientos de Orden Quirurgico. *Revista mexicana ciencia medical, 7:* 1–10, 1949.

CONZE, H.—and V. Iline. Notes Pratiques sur le Serum de Bogomoletz; Serum Antireticulocytotoxique. *France médicale, 12:* 9–12, 1949.

COSIN, L. Z.—Rehabilitation of the Chronic Sick; the Units of the Geriatric Department. *Nursing Mirror, 88:* 155, 1948.

COUPER, W. J.—Present-Day Pension Problems. *Personnel Management Record, 11:* 4–6, 36–42, 1949.

CROWDER, FARNSWORTH—California's Pension Mirage. *Survey, 85:* 216–218 +, 1949.

CUTLER, CONDICT W.—Biliary Tract Emergencies in the Aged. *Surgical Clinics of North America, 29:* 361–368, 1949.

DANZIGER, LEWIS—Entropy, Mental Disease and death. *Diseases of the Nervous System, 10:* 3–15, 1949.

DARLEY, W. (See Dodge, H. J.)

DAVSON, H.—Some Considerations on the Salt Content of Fresh and Old Ox Corneae. *British Journal of Ophthalmology, 33:* 175–182, 1949.

DICKINSON, F. G. —The Ages of Physicians in the United States, 1940 and 1948. *Journal of the American Medical Association, 139:* 51, 1949.

DODGE, H. J.—M. M. Clapper, and W. Darley. The Distribution of Physicians and Physicians' Services in Colorado, 1948; Age Factors. *Rocky Mountain Medical Journal, 45:* 1113–1119, 1948.

DUFF, JOHN—and Leonard V. Smiley. Urogenital Disorders of the Aged. *Medical Clinics of North America, 33:* 463–484, 1949.

ECKERSTRÖM, STEN — Sänkningsreaktionen hos åldringar (Sedimentation Rate in Normal Aged Persons.) *Nordisk Medicin, 41:* 471–472, 1949.

EDDY, R. W.—Gynecology in the Elderly Patient. *Ohio Medical Journal, 44:* 1210–1212, 1948.

ELKELES, A.—Radiological Studies of the Abdominal Aorta in Individuals over 50 as an Aid to the Differential Diagnosis between Benign and Malignant Ulceration of the Stomach. *British Journal of Radiology, 22:* 280–283, 1949.

EMPLOYMENT—Employment Handicaps of Older Workers. P. M. Smith. *American Journal of Economics and Sociology, 8:* 117–123, 1949.

Employment Status of Older Workers. C. A. Pearce. *Industrial Bulletin, 28:* 34–40, 1949.

ENDOCRINOLOGY—The Endocrine Aspects of Gerontology. Henry H. Turner. *Geriatrics, 4:* 74–78, 1949.

ENGELMAN, I. J.—Spotlight on Our Aging Population; Facts, Not Fancies. *Welfare Reporter, 3:* 12–15, 1949.

ESTES, W. L., JR.,—Reduction of Mortality in Surgery of the Aged. *St. Lukes Hospital Bulletin, 3:* 109–118, 1949.

EVANS, ELWYN—The Carotid Sinus Syndrome. *Geriatrics, 4:* 90–100, 1949.

EWELL, GEORGE H. — and Harold W. Bruskewitz. Prostatic Abscess in Elderly Patients. *Urologic and Cutaneous Review, 53:* 284–286, 1949.

FARR, LEE E.—(See Strobino, Louis J.)

FEIMAN, MORRIS S.—(See Appelman, David H.)

FRENCH, R. L.—(See Liebman, S.)

GALLINEK, ALFRED—The Nature of Affective and Paranoid Disorders during the Senium in the Light of Electric Convulsive Therapy. *Journal of Nervous and Mental Disease, 108:* 293–303,

1948. Abstracted in *Psychological Abstracts, 23:* 162, 1949.

GARDNER, T. S.—The Design of Experiments for the Cumulative Effects of Vitamins as Anti-Aging Factors. *Journal of the Tennessee Academy of Science, 23:* 291–306, 1948.

GASTROENTEROLOGY—Acute Intestinal Obstruction in the Patient over 60 years; Review of 80 Cases. H. B. Haley and A. S. Jackson. *Wisconsin Medical Journal, 47:* 1180–1184, 1948.

GENERAL—Baby Food for Methuselah. P. J. Whelihan. *Nation's Business, 37:* 76–80, 1949.

Cryptogram of Age. Anon. *Lancet, 256:* 657, 1949.

Family Life and Family Substitutes in Old Age. R. S. Cavan. *American Sociological Review, 14:* 17–83, 1949.

Future of Old Age. M. Gumpert. *Science Illustrated, 1:* 37–40, 1946.

History of Population Growth in the United States. R. K. Whelpton. *Scientific Monthly, 27:* 277–288, 1948.

How Best to Grow Old. A. Bryant. *Illustrated London News, 213:* 450, 1948.

Is There a Key to Long Life? Anon. *Science Digest, 25:* 74–75, 1949.

It Pays to Be Old in California. J. Marshall. *Collier's 123:* 28, Mar. 26, 1949.

Making Aged Healthy Seen as Way to Lasting Peace. Anon. *Science News Letter, 55:* 205, 1949.

Meadville's Oldsters Have Fun. S. B. Rosenbaum. *Welfare, 16:* 91–94, 1949.

Old-Age Problems in the Family. J. H. Sheldon. *Milbank Memorial Fund Quarterly, 27:* 119–132, 1949.

Old Age and Some of Its Problems. W. G. Lock. *Journal of the Royal Sanitary Institute, 62:* 93–100, 1949.

Problems of Old Age. W. A. Sanderson. *Nature, 163:* 221–223, 1949.

Ripe Old Age. Anon. *Science Illustrated, 3:* 112, Dec., 1948.

Social Medicine of Old Age (Abstract), J. H. Sheldon. *Nature, 162:* 466, 1948.

Spotlight on Our Aging Population; Facts, Not Fancies. I. J. Engelman. *Welfare Reporter, 3:* 12–15, 1949.

Thin Rats Bury the Fat Rats. J. Rorty. *Harper's Magazine, 198:* 28–34, May, 1949.

West May Need Chinese Attitude Toward Old Age. Anon. *Science News Letter, 55:* 57, Jan., 1949. Same abbreviated, *Science Digest, 25:* 38, April, 1949.

What Is New for the Old? A Crusader in the Interests of Older People Sees Encouraging Developments. O. A. Randall. *Better Times, 30:* 1–2, 9, Jan., 1949.

What Price Old Age? Anon. *Technocrat, 17:* 7, April, 1949.

GERIATRICS—Address Before the Public Health Forum, Harvard University, on Diseases of Middle and Old Age. L. A. Scheele. *Public Health Service,* 5 pages, 1949.

Geriatrics and Gerontology in Everyday Practice. R. Ginzberg. *Individual Psychology Bulletin, 7:* 21–29, 1949.

Medicine in an Aging Population. Edward J. Stieglitz. *Medical Clinics of North America, 33:* 295–308, 1949.

GINZBERG, R.—Geriatrics and Gerontology in Everyday Practice. *Individual Psychology Bulletin, 7:* 21–29, 1949.

Should the Elderly Cancer Patient Be Told? *Geriatrics, 4:* 101–107, 1949.

GLANDS—Quantitative Studies of Pancreas and Islands of Langerhans in Relation to Age, Sex, and Body Weight in White Leghorn Chickens. Eugene F. Oakberg. *American Journal of Anatomy, 84:* 279–310, 1949.

GOODMAN, J. I.—Care of the Chronically Ill. *Ohio State Medical Journal, 44:* 1205–1209, 1948.

GRANT, C. P.—Comparison of Results in a Series of Senile Cataract Extractions Using Three Techniques. *Jefferson Hillman Hospital Bulletin, 2:* 126–135, 1948.

GUMPERT, M.—Future of Old Age. *Science Illustrated, 1:* 37–40, 1946.

GYNECOLOGY—Gnecology in the Elderly Patient. R. W. Eddy. *Ohio Medical Journal, 44:* 1210–1212, 1948.

Prolapsoperationen bei alten Frauen. H. Roemer. *Zentralblatt für die gesamte Gynaekologie und Geburtshilfe sowie deren Grenzgebiete, 70:* 368–372, 1948.

Use of Estrogenic Cream in the Treatment of Senile Vaginitis. Charles M. McLane. *American Journal of Obstetrics and Gynecology, 57:* 1018–1019, 1949.

HALEY, H. B.—and A. S. Jackson. Acute Intestinal Obstruction in the Patient over 60 Years; Review of 80 Cases. *Wisconsin Medical Journal, 47:* 1180–1184, 1948.

HALLAM, KEITH H.—Pulmonary Tuberculosis in the Elderly. *Medical Journal of Australia, 1:* 206–207, 1949.

HARA, H.—Life-Expectancy Table for Women of Japan as of October 1, 1940. *Hukuoka acta medica, 39:* 103, Jun., 1948.

HARRIS, LOUIS—(See Appelman, David H.)

HENRICKS, J. R.—(See Larsh, J. E. Jr.)

HEART DISEASE—Acute Rheumatic Fever in the Aged. David H. Appelman, Morris S. Feiman, and Louis Harris. *American Heart Journal, 37:* 982–985, 1949.

Carotid Sinus Syndrome. Elwyn Evans. *Geriatrics, 4:* 90–100, 1949.

Quinidine in Geriatrics. S. A. Weisman. *Geriatrics, 4:* 80–85, 1949.

HITSCH, M. J.—M. Alpern and H. L. Schultz. The Variation of Phoria with Age. *American Journal of Optometry, 25:* 535–541, 1948.

HOFSTATTER, L.—(See Ackermann, P.)

HOMES—Convalescent Homes; the Need for Modernisation. H. Tidy. *Lancet, 1:* 577, 1949.

Model Institution Designed to Provide Homes for Aged People. Anon. *Canadian Hospital, 26:* 35, 1949.

Old Age; the Bradley Home. J. A. Wilson. *Meriden Hospital Bulletin, 2:* 1–8, 1949.

HORMONES—Mammary Cancer in Castrate Male Mice Receiving Ovarian and Hypophyseal Grafts at Various Ages. R. Silberberg and M. Silberberg. *Proceedings of the Society for Experimental Biology and Medicine, 70:* 510–513, 1949.

Quantitative Studies of Pancreas and Islands of Langerhans in Relation to Age, Sex, and Body Weight in White Leghorn Chickens. Eugene F. Oakberg. *American Journal of Anatomy, 84:* 279–310, 1949.

HOSPITALS—Patient Population Distribution in Mental Hospitals in the United States. S. Liebman and R. L. French. *American Journal of Psychiatry, 105:* 489–493, 1949.

HOWELL, T. H.—The Cardiovascular System in Old Age. *Medical World, 69:* 679–681, 1949.

Geriatric Rehabilitation. *Occupational Therapy and Rehabilitation, 27:* 468–472, 1948.

Senile Diseases of the Central Nervous System. *Medical World, 69:* 392–396, 1948.

ILINE, V.—(See Conze, H.)

JACKSON, A. S.—(See Haley, H. B.)

JUDMAIER, F.—Die Behandlung peripherer Durchblutungsstörungen mit besonderer Berücksichtigung der alten Erfrierungen. *Wiener klinische Wochenschrift, 61:* 85–90, 1949.

KAPLAN, H.—(See Scott, D. B.)

KENDALL, H. O.—and R. P. Kendall. Normal Flexibility According to Age Groups. *Journal of Bone Surgery, 30A:* 690–694, 1948.

KENDALL, R. P.—(See Kendall, H. O.)

KINNAMAN, J. H.—Planning for the Chronically Ill; A Cooperative Task. *New York Journal of Medicine, 49:* 527–530, 1949.

KORENCHEVSKY, V.—The Problem of Age-

ing; Basic Difficulties of Research. *British Medical Journal, 1:* 66–68, 1949.

KOUNTZ, W. B.—(See Ackermann, P.)

KRIEGER, C. I.—(See Rafsky, H. A.)

LARSH, J. E., JR.—and J. R. Henricks. The Probable Explanation for the Difference in the Localization of Adult Trichinella spiralis in Young and Old Mice. *Journal of Parasitology, 35:* 101–106, 1949.

LAWRENCE, P. S. — Chronic Illness and Socio-Economic Status. *Public Health Report, 63:* 1507–1521, 1948.

LEVINE, H. A.—Recreation and Services for the Aged. *Bulletin of the American Association of Medical Social Workers, 22:* 11–16, Feb. 1949.

LIEBMAN, S.—and R. L. French. Patient Population Distribution in Mental Hospitals in the United States. *American Journal of Psychiatry, 105:* 489–493, 1949.

LOCK, W. G.—Old Age and Some of Its Problems. *Journal of the Royal Sanitary Institute, 62:* 93–100, 1949.

LOEB, LEO—Aging Processes in the Ovaries of Mice Belonging to Strains Differing in the Incidence of Mammary Carcinoma. *Archives of Pathology, 46:* 401–440, 1948.

MALAMUD, IRENE T.—(See Malamud, William)

MALAMUD, William — Sidney L. Sands, Irene T. Malamud, and Phillip J. P. Powers. The Involutional Psychoses. A Socio-Psychiatric Follow-up Study. *American Journal of Psychiatry, 105:* 567–572, 1949. Abstracted in *Digest of Neurology and Psychiatry, 17:* 150, 1949.

MARSHALL, J.—It Pays to Be Old in California. *Collier's, 123:* 28+, Mar. 26, 1949.

MCLANE, CHARLES M.—The Use of Estrogenic Cream in the Treatment of Senile Vaginitis. *American Journal of Obstetrics and Gynecology, 57:* 1018–1019, 1949.

MEHTA, V. P.—(See Worah, C. S.)

MOESCHLIN-SANDOZ, Y. — Seniler Macula-Pseudotumor mit multiplen Herden. *Ophthalmologica, 116:* 272–276, 1948.

NERVOUS SYSTEM—Senile Diseases of the Central Nervous System. T. H. Howell. *Medical World, 69:* 392–396, 1948.

NEUROLOGY — Neurological Disorders in Later Life. Lewis J. Pollock. *Geriatrics, 4:* 108–112, 1949.

NEWMAN, B.—(See Rafsky, H. A.)

NEWTON, R. D.—The Identity of Alzheimer's Disease and Senile Dementia and Their Relationship to Senility. *Journal of Mental Science, 94:* 225–249, 1949. Abstracted in *Psychological Abstracts, 23:* 139, 1949.

NIELSEN, A.—(See Clemmesen, J.)

NUTRITION—Analytical and Experimental Study of the Effects of Increased Protein with Liberal Calcium and Riboflavin Intakes; Complete Life Cycles. H. C. Sherman and H. L. Campbell. *Journal of Nutrition, 37:* 317–327, 1949.

Carencias Habituales en las Gravidas, en la Madre Lactante y en la Senectud. Oscar H. Solá and Nestor Serantes. *Revista de la Asociación médica argentina, 63:* 23–38, 1949.

Concentration of Free Valine, Tryptophane, and Histidine of Plasma of Young and Old Individuals, Determined with the Microbiologic Method. P. Ackermann, L. Hofstatter,, and W. B. Kountz. *Journal of Laboratory and Clinical Medicine, 34:* 234–238, 1949.

Design of Experiments for the Cumulative Effects of Vitamins as Anti-Aging Factors. T. S. Gardner, *Journal of the Tennessee Academy of Science, 23:* 291–306, 1948.

Pantothenic Acid and Longevity. Anon. *Nutrition Reviews, 7:* 37–38, 1949.

Study of Nutrition in Relation to Aging.

Anon. *California Health, 6:* 49, Oct., 1948.

OAKBERG, EUGENE F.—Quantitative Studies of Pancreas and Islands of Langerhans in Relation to Age, Sex, and Body Weight in White Leghorn Chickens. *American Journal of Anatomy, 84:* 279–310, 1949.

OBSTETRICS—Elderly Primagravida. Anon. *Lancet, 256:* 696–697, 1949.

ODENTHAL, F.—Ueber altersbedingte Aenderungen des peripheren Venendruckes bei gesunden Menschen. *Deutsche medizinische Wochenschrift, 74:* 112–114, 1949.

OPHTHALMOLOGY—Comparison of Results in a Series of Senile Cataract Extractions Using Three Techniques. C. P. Grant. *Jefferson Hillman Hospital Bulletin, 2:* 126–135, 1948.

Effect of Age and Illumination upon Visual Performance with Close Sights. H. C. Weston. *Transactions of the American Academy of Ophthalmology and Otolaryngology:* 394–400, Mar.-April, 1949.

Seniler Macula-Pseudotumor mit multiplen Herden. Y. Moeschlin-Sandoz. *Ophthalmologica, 1116:* 272–276, 1948.

Some Considerations on the Salt Content of Fresh and Old Ox Corneae. H. Davson. *British Journal of Ophthalmology, 33:* 175–182, 1949.

Ueber eine Sippe mit teils präseniler, teils infantiler erblicher Katarakt. T. Redl. *Klinische Monatsblätter für Augenheilkunde, 114:* 24–33, 1949.

Variation of Phoria with Age. M. J. Hitsch, M. Alpern, and H. L. Schultz. *American Journal of Optometry, 25:* 535–541, 1948.

PARASITOLOGY—The Probable Explanation for the Difference in the Localization of Adult Trichinella spiralis in Young and Old Mice. J. E. Larsh, Jr., and J. R. Henricks. *Journal of Parasitology, 35:* 101–106, 1949.

PEARCE, C. A. — Employment Status of Older Workers. *Industrial Bulletin, 28:* 34–40, 1949.

PENSIONS — California's Pension Mirage. Farnsworth Crowder. *Survey, 85:* 216–218 +, 1949.

Case Against Higher Old-Age Pensions. Anon. *National Insurance Gazette, 37:* 616–617, 1948.

Pension Plans as a Subject of Collective Bargaining. W. G. Caples. *Personnel Management Record, 11:* 4–6, 36–42, 1949.

Present-Day Pension Problems. W. J. Couper. *Personnel Management Record, 11:* 4–6, 36–42, 1949.

What Next in Company Pension Plans? Anon. *Personnel Management Record, 11:* 4–6, 36–42, 1949.

PERRIGARD, G. E.—Surgical Approach to Strangulated Hernia in the Aged. *Journal of the International College of Surgeons, 12:* 183, 1949.

POGGE, O. C.—Administrative Costs of Old-Age and Survivors Insurance. *American Economic Security, 6:* 10–16, Mar., 1949.

POLLOCK, LEWIS J.—Neurological Disorders in Later Life. *Geriatrics, 4:* 108–112, 1949.

POWERS, PHILLIP J. P.—(See Malamud, William)

PSYCHIATRY—Entropy, Mental Disease and Death. Lewis Danziger. *Diseases of the Nervous System, 10:* 3–15, 1949.

Identity of Alzheimer's Disease and Senile Dementia and Their Relationship to Senility. R. D. Newton. *Journal of Mental Science, 94:* 225–249, 1949. Abstracted in *Psychological Abstracts, 23:* 139, 1949.

Involutional Psychoses. A Socio-Psychiatric Follow-up Study. William Malamud, Sidney L. Sands, Irene T. Malamud, and Phillip J. P. Powers. *American Journal of Psychiatry, 105:* 567–572, 1949. Abstracted in *Digest of Neurology and Psychiatry, 17:* 150, 1949.

Patient Population Distribution in Mental Hospitals in the United States. S. Liebman and R. L. French. *American Journal of Psychiatry, 105:* 489–493, 1949.

Nature of Affective and Paranoid Disorders during the Senium in the Light of Electric Convulsive Therapy. Alfred Gallinek. *Journal of Nervous and Mental Disease, 108:* 293–303, 1948. Abstracted in *Psychological Abstracts, 23:* 162, 1949.

Opinions Concerning Incidence and Discharge Rates for Mental Illness. G.V. Ramsey. *Journal of Consulting Psychology, 13:* 50–55, 1949.

Pneumoencephalographic Diagnosis of the Presenile Dementias. P. Chodoff. *Archives of Neurology and Psychiatry, 59:* 823–826, 1948.

Presenile Sclerosis (Alzheimer's Disease) with Features Resembling Pick's Disease. Louis Berlin. *Archives of Neurology and Psychiatry, 61:* 369–384, 1949.

PSYCHOLOGY—Psychological Orientation in Geriatrics. Edward B. Allen. *Geriatrics, 4:* 67–73, 1949.

PUBLIC WELFARE—Ceilings Increased on Aid for the Aged and Blind. Anon. *Public Aid in Illinois, 16:* 1, 1949.

Public Health Care of the Healthy Aged. F. A. Belam. *Medical Officer, 81:* 83, 1949.

Special "Needs of the Aged" Issue. Anon. *Louisiana Welfare, 8:* no. 4, 1948.

RAFSKY, H. A.—B. Newman, and C. I. Krieger. An Electrophoretic Analysis of the Plasma Proteins in the Aged. *American Journal of Medical Sciences, 217:* 206–210, 1949.

RAGAN, M. S.—(See Sherman, H. C.)

RAMSEY, G. V.—Opinions Concerning Incidence and Discharge Rates for Mental Illness. *Journal of Consulting Psychology, 13:* 50–55, 1949.

RANDALL, O. A.—What Is New for the Old? A Crusader in the Interests of Older People Sees Encouraging Developments. *Better Times, 30:* 1–2, 9, 1949.

RECHENBERGER, J.—(See Schairer, E.)

RECREATION—Recreation and Services for the Aged. H. A. Levine. *Bulletin of the American Association of Medical Social Workers, 22:* 11–16, Feb., 1949.

REDL, T. — Ueber eine Sippe mit teils präseniler, teils infantiler erblicher Katarakt. *Klinische Monatsblätter für Augenheilkunde, 114:* 24–33, 1949.

REHABILITATION—Geriatric Rehabilitation. T. H. Howell. *Occupational Therapy and Rehabilitation, 27:* 468–472, 1948.

Rehabilitation of the Chronic Sick; the Units of the Geriatric Department. L. Z. Cosin. *Nursing Mirror, 88:* 155, 1948.

RESEARCH—The Problem of Ageing; Basic Difficulties of Research. V. Korenchevsky. *British Medical Journal, 1:* 66–68, 1949.

RETIREMENT—Does Death Follow Retirement? Anon. *Personnel Management Record, 11:* 121–123, 1949.

Working Toward Vocational Oblivion. Anon. *Digest of Neurology and Psychiatry, 17:* 123–125, 1949.

ROEMER, H.—Prolapsoperationen bei alten Frauen. *Zentralblatt für die gesamte Gynaekologie und Geburtshilfe sowie deren Grenzgebiete, 70:* 368–372, 1948.

RORTY, J.—Thin Rats Bury the Fat Rats. *Harper's Magazine, 198:* 28–34, May, 1949.

ROSENBAUM, S. B.—Meadville's Oldsters Have Fun. *Welfare, 16:* 91–94, April, 1949.

SANDERSON, W. A.—Problems of Old Age. *Nature, 163:* 221–223, 1949.

SANDS, SIDNEY L.—(See Malamud, William)

SCHAIRER, E.—and J. Rechenberger. Das Leber– und Milzeisen bei Mann und Frau in verschiedenen Lebensaltern. *Virchows Archiv für pathologische Anatomie und Physiologie und für klinische Medizin, 315:* 309–319, 1949.

SCHEELE, L. A.—Address before the Public Health Forum, Harvard University,

on Diseases of Middle and Old Age. *Public Health Service,* 5 pages, 1949.

SCHULTZ, H. L.—(See Hitsch, M. J.)

SCOTT, D. B.—H. Kaplan, and R. G. W. Wyckoff. Replica Studies of Changes in Tooth Surfaces with Age. *Journal of Dental Research, 28:* 31–47, Feb., 1949.

SERANTES, NESTOR—(See Solá, Oscar H.)

SHELDON, J. H.—Old-Age Problems in the Family. *Milbank Memorial Fund Quarterly, 27:* 119–132, 1949.

Social Medicine of Old Age. (Abstract) *Nature, 162:* 466, 1948.

SHERMAN, H. C. — H. L. Campbell, and M. S. Ragan. Analytical and Experimental Study of the Effects of Increased Protein with Liberal Calcium and Riboflavin Intakes; Complete Life Cycles. *Journal of Nutrition, 37:* 317–327, 1949.

SHIGON, NORMAN—and Myrtle C. Stanton. An Experiment in Caring for the Aged Sick. *Southern Hospitals, 17:* 23–24, 1949.

SHOCK, NATHAN W.—(See Cohn, Jerome E.)

SILBERBERG, M.—(See Silberberg, R.)

SILBERBERG, R.—Mammary Cancer in Castrate Male Mice Receiving Ovarian and Hypophyseal Grafts at Various Ages. *Proceedings of the Society for Experimental Biology and Medicine, 70:* 510–513, 1949.

SMILEY, LEONARD V.—(See Duff, John)

SMITH, P. M.—Employment Handicaps of Older Workers. *American Journal of Economics and Sociology, 8:* 117–123, 1949.

SOCIAL SECURITY—Administrative Costs of Old-Age and Survivors Insurance. O. C. Pogge. *American Economic Security, 6:* 10–16, Mar., 1949.

SOLÁ, OSCAR H.—and Nestor Serantes. Carencias Habituales en las Gravidas, en la Madre Lactante y en la Senectud. *Revista de la Asociación médica argentina, 63:* 23–38, 1949.

STANTON, MYRTLE C.—(See Shigon, Norman)

STIEGLITZ, EDWARD J. — Medicine in an Aging Population. *Medical Clinics of North America, 33:* 295–308, 1949.

STITH, R. B.—(See Bridgers, W. H.)

STROBINO, LOUIS J.—and Lee E. Farr. The Relation to Age and Function of Regional Variations in Nitrogen and Ash Content of Bovine Bone. *Journal of Biological Chemistry, 178:* 599–609, 1949.

SURGERY—Biliary Tract Emergencies in the Aged. Condict W. Cutler. *Surgical Clinics of North America, 29:* 361–368, 1949.

Reduction of Mortality in Surgery of the Aged. W. L. Estes, Jr. *St. Luke's Hospital Bulletin, 3:* 109–118, 1949.

Surgical Approach to Strangulated Hernia in the Aged. G. E. Perrigard. *Journal of the International College of Surgeons, 12:* 183, 1949.

Surgical Correction of Senescent Pendulous Cheeks. A. M. Brown. *Journal of the International College of Surgeons, 12:* 154–160, 1949.

TEETH—Replica Studies of Changes in Tooth Surfaces with Age. D. B. Scott, H. Kaplan, and R. G. W. Wyckoff. *Journal of Dental Research, 28:* 31–47, 1949.

TIDY, H.—Convalescent Homes; the Need for Modernisation. *Lancet, 1:* 577, 1949.

TUBERCULOSIS — Pulmonary Tuberculosis in the Elderly. Keith H. Hallam. *Medical Journal of Australia, 1:* 206–207, 1949.

TURNER, HENRY H.—The Endocrine Aspects of Gerontology. *Geriatrics, 4:* 74–78, 1949.

UNDRITZ, E.—(See H. von Bidder)

UROLOGY—Senile Enlargement of Prostate with Analysis of 50 Cases. *Antiseptic, 45:* 577, 678–689, 856, 1948.

Prostatic Abscess in Elderly Patients. George H. Ewell and Harold W. Bru-

skewitz. *Urologic and Cutaneous Review, 53:* 284–286, 1949.

Urogenital Disorders of the Aged. John Duff and Leonard V. Smiley. *Medical Clinics of North America, 33:* 463–484, 1949.

VITAL STATISTICS — *Age Distribution* Figures for Malignant Diseases in Denmark, 1942–1944. J. Clemmesen, T. Busk, and A. Nielsen. *Acta radiologica, 31:* 51–59, 1949.

Ages of Physicians in the United States, 1940–1948. F. G. Dickinson. *Journal of the American Medical Association, 139:* 51, 1949.

Distribution of Physicians and Physicians' Services in Colorado, 1948; Age Factors. H. J. Dodge, M. M. Clapper, and W. Darley. *Rocky Mountain Medical Journal, 45:* 1113–1119, 1948.

Life-Expectancy Table for Women of Japan as of October 1, 1940. H. Hara. *Hukuoka acta medica, 39:* 103, 1948.

National Academy of Sciences; Distribution and Ages of Membership. F. E. Wright. *Proceedings of the National Academy of Science, 35:* 117–125, 1949.

Population Density, Life Span, and Mortality Rates of Small Mammals in the Blue-Grass Meadow and Blue-Grass Field Associations of Southern Michigan. W. F. Blair. *American Midland Naturalist, 40:* 395–419, 1948.

WEISMAN, S. A.—*Quinidine in Geriatrics. Geriatrics, 4:* 85–89, 1949.

WESTON, H. C.—Effect of Age and Illumination upon Visual Performance with Close Sights. *Transactions of the American Academy of Ophthalmology and Otolaryngology:* 394–400, Mar.-April, 1949.

WHELIHAN, P. J.—Baby Food for Methuselah. *Nation's Business, 37:* 76–80, Mar., 1949.

WHELPTON, P. K.—A History of Population Growth in the United States. *Scientific Monthly, 27:* 277–288, Oct., 1948.

WILSON, J. A.—Old Age; the Bradley Home. *Meriden Hospital Bulletin, 2:* 1–8, 1949.

WORAH, C. S.—and V. P. Mehta. Senile Enlargement of Prostate with Analysis of 50 cases. *Antiseptic, 45:* 577, 678–689, 856, 1948.

WRIGHT, F.E.—National Academy of Sciences; Distribution and Ages of Membership. *Proceedings of the National Academy of Science, 35:* 117–125, 1949.

WYCKOFF, R. G. W.—(See Scott, D. B.)